NOW READY. HANDSOMELY BOUND IN EXTRA CLOTH.

Vol. XV. of the PRACTICAL TEACHER.

Price 12/- Post free to Teachers 9/-

No. 2.—Vol. 16.
August, 1895.

The Practical Teacher

Price Sixpence.

CONTENTS.

	PAGE
Well-known Teachers at Work. XLIII.—Mr. Alfred Blenkinsop. With Portrait	59
New Problems in Arithmetic. By T. B. Ellery, F.R.G.S.	63
Education Department	65
Mental Arithmetic for the Standards. By T. B. Ellery, F.R.G.S.	69
For Pupil Teachers' and Scholarship Course. By Arthur T. Flux	71
New Composition Stories.—Standard V. ...	78
New Reading Tests.—Standard III. ...	80
New Dictation Tests.—Standard IV. ...	81
Modern Educational Reformers. By Thomas Cartwright, B.A., B.Sc. (Lond.). No. XX.—Thomas Henry Huxley, M.D., LL.D., D.C.L., F.R.S. With Portrait	84
Elementary Lessons in Agricultural Zoology. By Professor J. R. Green, Sc.D., and F. L. Green	88
Conversational Lessons in Chemistry. By Thomas Cartwright, B.A., B.Sc. (Lond.)	90
Notes and Notions. By Richard Waddington	90
'Doctor Daymond's Grammar Boys.' By Joseph Despicht	93
Examination in Geometrical Drawing, with Solutions	97
Teachers' Drawing Lessons. By E. Buffery Ridge	101
Legal and Code Queries Column	101
Education Department—Scotland	102
Our 1896 Certificate Class. By J. C. Horobin, M.A.	102
Music—'Dreams of Childhood'	106
Solutions to Questions in Theoretical Mechanics. By F. Castle, M.I.M.E. ...	107
Organic Chemistry Notes. By J. T. Hewitt, M.A., D.Sc., Ph.D.	110
Honours Physiography Notes. By A. M. Davies, B.Sc. (Lond.), F.G.S.	112
Science Notes	113
Reviews	114

London: JOSEPH HUGHES & CO., Froebel House, St. Andrew's Hill, Doctors' Commons, E.C.

ALL RIGHTS RESERVED

OURWEN'S AUGUST LIST.

ELIZABETHAN MADRIGALS.

Arranged for S.S.C. for School Use. Price 1s. per 100.

268	O happy he who liveth	Gastoldi.
269	Soon as I careless strayed	Festa.
270	Ditto, Staff Notation.	
271	Soldiers, brave and gallant be	Gastoldi.
272	Ditto, Staff Notation.	
273	What saith my dainty darling?	Morley.
274	In going to my lonesome bed	Edwardes.
275	Ditto, Staff Notation.	
276	Since first I saw your face	Ford.
277	Sing we and chaunt it	Morley.
278	Now is the month of maying	Morley.
279	My bonnie lass, she smileth	Morley.
280	Come again, Sweet Love	Dowland.
281	The silver swan	Orlando Gibbons.
282	Welcome, sweet pleasure	J. Weelkes.
283	The Nightingale	J. Weelkes.
284	Ditto, Staff Notation.	
285	My lady is as fair	J. Bennett.
287	The Waits	J. Saville.
288	Lady fair, why dost thou?	Gastoldi.
289	Dainty fine, Sweet Nymph	Morley.
290	Hence, dull care and sadness	Gastoldi.
303	Oriana's presence	A. Smith.
304	Ditto, Staff Notation.	
305	O! sweet content	E. H. Smith.
306	Ditto, Staff Notation.	
307	Maidens fair of Mantua's city	Gastoldi.
308	Winter stern	F. Adlam.
309	Fair as Cynthia	W. McKendrick.
311	A Song to Spring	H. E. Nichol.
313	Ditto, Staff Notation.	

CRICKET SONGS.

King Cricket. By A. B. Cooper and E. Markham Lee, Mus. Bac. *Unison Songs*, No. 17. *Both* notations, 1*d*.

Cricket Song. By Brockington and T. Facer. *Unison Songs*, No. 19. *Both* notations, 1*d*.

The Crack of the Willow. By H. Cockerell and T. Facer. *Unison Songs*, No. 23. *Both* notations, 1*d*.

The Cricket Song. By A. L. Cowley. Action Song for school concerts. Full song size, 1*s*.

At a Cricket Match. By F. Edmonds and C. T. West. Humorous sketch for Jack and Maria. *Choral Handbook*, No. 400. O.N., 6*d*.; Tonic Sol-fa, 1*d*.

ACTION SONGS FOR SCHOOL CONCERTS.

Our Gay Balloons. Words by Edward Parkinson. Music by Percy Jackman. With drill for toy balloons. Original and pretty effects.

Dolly's Outing. By Oswald Ling and Charles D'Acre. Child language and play with doll and go-cart. Very tuneful.

The Tin Whistle Band. By J. J. Taylor and C. Hutchins Lewis. Fun for boys who play or think they can play.

Old Age. By Mary Arnold and Percy Jackman. Pretending to be old and giving sage advice. Girls' costume song.

Price 1s. each. Full song size.

THIS DAY.

INSPECTOR FOR AN HOUR;

Or, Disaster Averted.

Written by FRANK BOOTH and W. M. STANSFIELD. Composed by FRANK BOOTH.

A comical school examination takes place by an unauthorised person. H.M. Inspector turns up, and the story tells how disaster was averted. The absurdity of the questions asked, and the repartee of the children provoke fun such as teachers, scholars, and audience will enjoy. No one would mistake the burlesque for the real inspection, hence there can be no harm in having a laugh when the strain of the Government Examination is over. Nine numbers and some racy dialogue. Two-part choruses.

O.N., with accompaniment, 1s. 6d. Tonic Sol-fa (in the press), **4d.**

LONDON: J. CURWEN & SONS, 8 & 9, Warwick Lane, E.C.

Now Ready. Extra Cloth. Price 2/6.

SCHOLARSHIP ALGEBRA.

With very numerous P.T. and Scholarship Examination Questions.

BY

W. T. THOMPSON, B.A. (Lond.),

Formerly Co-Director of the Birkbeck Training Classes.

'THE CLEAREST EXPONENT I HAVE EVER SEEN.'—*Lady Principal, The Princess Helena College, Ealing, W.*

AIM AND SCOPE OF WORK.

This book is primarily intended to meet the needs of candidates for the Queen's Scholarship Examination, the Oxford and Cambridge Locals, the Examination of the College of Preceptors, and of women students for the Certificate Examinations of the Education Department.

The subject is treated in a popular and simple style. Rural pupil teachers preparing for the Scholarship Examination, who are not able to secure the good tuition which pupil teachers in town generally enjoy, will find this book, with its easy and perfect graduation, its simplicity of exposition, and abundance of worked exercises, just the thing they need. All pupil teachers will find it includes everything which may possibly be asked for at the Scholarship Examination. The solution of simple and quadratic equations, in particular, is treated with a fulness found in no other treatise on Elementary Algebra. The exercises include every single question set at the Scholarship Examination for the last fifteen years, a large number of those set during recent years to both English and Scotch pupil teachers, and an abundant selection of examples from the University Local Examinations, the Examinations of the College of Preceptors, and the Certificate Papers set to women students by the Education Department.

A Principal of Training Classes writes: 'I beg to express my thanks for the copy of "Scholarship Algebra"; the work is just suited to young teachers' requirements, and it will be my duty to advise my pupils to read from this well-designed mathematical aid.'

A Head Master writes: 'It is excellent, and I shall adopt it here. We use your textbooks in Physiography in my class with much success.'

JOSEPH HUGHES & CO., FROEBEL HOUSE, ST. ANDREW'S HILL, DOCTORS' COMMONS, LONDON, E.C.

The
Practical Teacher
A MONTHLY EDUCATIONAL JOURNAL.
Edited by JOSEPH HUGHES.

'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

VOL. XVI. NO. 2. AUGUST, 1895. PRICE, 6D. POST FREE, 8D.

WELL-KNOWN TEACHERS AT WORK.

XLIII.—MR. ALFRED BLENKINSOP.

Kirkstall Board School, Leeds.

IT is no small tribute to the general efficiency of education in Yorkshire that so many of the well-known teachers should be found in that county. The city of Leeds in particular is to be congratulated upon the educational status of the pedagogues it employs. To borrow an expressive phrase from the descriptive writer on the staff of the *Schoolmaster*, Leeds, like Manchester, is not a health resort. Still the visitor to the Kirkstall Board School is presented on his arrival with as picturesque a view as can be obtained in many far more renowned localities. The school stands on an eminence which commands an extensive panorama. In the valley below, the Aire meanders, not exactly in the pellucid condition which was formerly its wont, but still devoid of the multifarious chemical properties which it absorbs in its course through the city. On the neighbouring hill the industrial suburb of Armley lies, surmounted by its newly acquired public park, and in the centre of this district rise dark and gloomy the massive walls of Armley Gaol. On the Kirkstall side of the river we notice the famous Kirkstall Forge, and turning to our left and shutting out the forest of tall factory chimneys which emit the pall that hangs over the city, we have a refreshing glimpse of the country; and in the foreground the venerable ruins of Kirkstall Abbey impress us with reflections upon what the beauty of the valley before us must have been ere the advent of the factory and the forge. It is, indeed, a pleasant situation, within easy access of the city, and yet possessing a semi-rural aspect which comes as a relief to one whose labours have been confined within the area of a murky town.

The school itself is a stone building, and consists of an Infants' Department on the basement, and a Mixed Department above. Here we find the subject of our present sketch, and a cheery Yorkshire welcome he gives us.

Explaining the object of our visit, a few minutes' conversation produces the information necessary to enlighten our readers upon Mr. Blenkinsop's professional career.

Mr. Blenkinsop is a native of Leeds, being introduced to this sphere of ours in that city some forty years ago. He received his elementary education at the Royal Lancasterian Schools, Leeds, and was afterwards apprenticed there as a pupil teacher under Mr. Thos. Hick, B.A., B.Sc. During the period of his apprenticeship the school was taken over by the Leeds School Board. In 1874 Mr. Blenkinsop was appointed Assistant Master at the Meadow Lane Board School. Here he was engaged for a year, when he was transferred to the Prince's Field Board School. It was at this school, then under the supervision of Mr. W. H. Haler, now H.M.I.S. in the Leeds district, that Mr. Blenkinsop developed that particular ability which has earned him the reputation as a successful teacher which he possesses. Mr. Haler spoke of him in the highest possible terms when he was again transferred to the Low Road Board School in 1877.

The School Board having realised the value of Mr. Blenkinsop's services, he was not long permitted to remain in a subordinate position.

His remarkable capability as a disciplinarian led the Board to entrust him with a delicate responsibility. In August 1877, the School Board took charge of the Certified Industrial School, then situated in Edgar Street, Leeds. This establishment had previously been managed by a committee, and it was necessary that a capable teacher should be placed in charge in order that the school should be brought into line with the requirements of the time. With this task Mr. Blenkinsop was entrusted.

The Leeds Board subsequently erected the Industrial School, now occupied, at Shadwell, but Mr. Blenkinsop preferred to return to ordinary work. He accepted the position of senior assistant in the Gower Street Board School, a school occupied mainly by Jewish pupils. On leaving this school in 1884, he was the recipient of an unsolicited testimonial from Dr. Levy, the Chief Rabbi of the Great Synagogue at Leeds, which bears splendid testimony to his abilities.

KIRKSTALL BOARD SCHOOL, LEEDS.—MIXED DEPARTMENT.

TIME TABLE.

Duration of Lessons.		9—9.30.	9.30—10.15.	10.15—10.50.	10.50—11 0.	11—11.30.	11.30—12.	1.35—2.15.	2.15—2.50.	2.50—3.0.	3.0—3.30.	3.30—4.0.
Monday.	Standard I.	Hymn, Prayer, and Religious Instruction.	Reading	Object Lesson	Recreation.	Arithmetic	Transcription	Transcription	Arithmetic	Recreation.	Drawing	Drawing
	II.		Reading	Grammar		Arithmetic	Dictation	Arithmetic	Dictation		Reading	Spelling
	III.		Copy Books	Arithmetic		Grammar	Grammar	Arithmetic	Transcription		Recitation	Reading
	IV.		Copy Books	Recitation		Dictation	Arithmetic	Varied Occupations	Varied Occupations		Geography	Geography
	V.		Copy Books	Arithmetic		Mental Arithmetic	Reading	Arithmetic	Composition		Geography	Recitation
	VI.		Copy Books	Physiology		Grammar	Grammar	Composition	Arithmetic		Spelling	Reading
	VII.		,,	,,		,,	,,	,,	,,		,,	,,
Tuesday.	I.		Reading	Arithmetic		Splg. & Word Bldng.	Copy Books	Reading	Grammar		Arithmetic	Dictation
	II.		Reading	Geography		Copy Books	Arithmetic	Arithmetic	Mental Arithmetic		Geography	Splg. & Word Bldng.
	III.		Varied Occupations	Dictation		Mental Arithmetic	Geography	Dictation	Arithmetic		Splg. & Word Bldng.	Drawing
	IV.		Reading	Grammar		Composition	Arithmetic	Reading	Drawing		Dictation	Arithmetic
	V.		Arithmetic	Grammar		Grammar	Reading	Spelling 1.35—2.	Drawing 2—2.50.		Recitation	Composition
	VI.		Arithmetic	Composition		Geography	Map Drawing	Grammar	Drawing		Grammar	Recitation
	VII.		,,	,,		,,	,,	,,	,,		,,	,,
Wednesday.	I.		Geography	Mental Arithmetic		Splg. & Word Bldng.	Arithmetic	Drawing	Transcription		Recitation	Singing
	II.		Reading	Grammar		Dictation	Copy Books	Drawing	Drawing		Arithmetic	Singing
	III.		Splg. & Word Bldng.	Arithmetic		Reading	Reading	Grammar	Grammar		Recitation	Singing
	IV.		Arithmetic	Reading		Dictation	Grammar	Geography	Geography		Mental Arithmetic	Singing
	V.		Dictation	Arithmetic		Spelling	Reading	Geography	Map Drawing		Composition	Singing
	VI.		Arithmetic	Dictation		Reading	Grammar	Geography	Reading		Mental Arithmetic	Singing
	VII.		,,	,,		,,	,,	,,	,,		,,	,,
Thursday.	I.		Reading	Tables		Arithmetic	Dictation	Transcription	Arithmetic		Reading	Splg. & Word Bldng.
	II.		Object Lesson	Tables		Dictation	Arithmetic	Reading	Mental Arithmetic		Transcription	Arithmetic
	III.		Dictation	Arithmetic		Object Lesson	Reading	Arithmetic	Transcription		Geography	Geography
	IV.		Reading	Recitation		Arithmetic	Spelling	Arithmetic	Dictation		Grammar	Grammar
	V.		Composition	Reading		Physiology	Physiology	Geography	Grammar		Arithmetic	Arithmetic
	VI.		Arithmetic	Composition		Geography.	Reading	Reading	Mental Arithmetic		Arithmetic	Composition
	VII.		,,	,,		,,	,,	,,	,,		,,	,,
Friday.	I.		Geography	Grammar		Transcription	Copy Books	Varied Occupations	Object Lesson		Splg. & Word Bldng.	Singing
	II.		Reading	Splg. & Word Bldng.		Dictation	Recitation	Drawing	Varied Occupations		Varied Occupations	Singing
	III.		Splg. & Word Bldng.	Dictation		Reading	Reading	Drawing	Drawing		Reading	Singing
	IV.		Arithmetic	Copy Books		Dictation	Mental Arithmetic	Drawing	Drawing		Spelling	Singing
	V.		Composition	Arithmetic		Reading	Dictation	Drawing	Drawing		Grammar	Singing
	VI.		Arithmetic	Composition		Reading	Splg. & Word Bldng.	Drawing	Drawing		Recitation	Singing
	VII.		,,	,,		,,	,,	,,	,,		,,	,,

Notes.—(*a*) The Girls take Sewing on Mondays and Thursdays from 1.30 to 2.50.
(*b*) Cookery for all Girls above Standard III. on alternate Thursdays from 9.30 to 4.
(*c*) Drill and Physical Exercises on Wednesdays.
(*d*) Girls attend the Swimming Bath on alternate Mondays, and Boys on alternate Wednesdays.
(*e*) A Criticism Lesson, at which all the Teachers are present, is given every Wednesday at 3.45.
(*f*) Five minutes' Mental Arithmetic at commencement of each Arithmetic Lesson.

From Gower Street Mr. Blenkinsop went to take charge of the Rodley Board School. Here he accomplished most successful work, the examination being excused in 1889. From Rodley he proceeded to his present school. A handsome marble clock now in his possession bears witness to the esteem in which he was held by his staff and pupils at Rodley.

A tour round the Kirkstall school is pleasing. At the time of our visit the windows and the desks of the teaching staff were tastefully decorated with cut flowers. The flowers are brought by the pupils, and are handed to a few of the girls who are told off for the duty, and these arrange them in the tasteful manner referred to.

The walls are covered with pictures, many of which are useful in illustrating various lessons embraced in the school curriculum.

A well-stocked museum supplies the staff with many objects which speak for themselves and obviate much tedious description.

The average attendance is two hundred and seventy. The school was built some thirteen years ago, but it was found necessary to enlarge the premises in 1890, when two new wings were added.

Alf. Blenkinsop.

Devoting our attention for some time to the work of the school, we find that Mr. Blenkinsop has taken the fullest advantage of the more educational methods allowed by recent Codes. In the elementary subjects the Writing is noticeable, being of an uniform style throughout the school. Reading is fluent and excellently taught. Arithmetic deserves particular attention on the part of the visitor. Mental work plays a most prominent part in the methods of instruction. The ordinary Arithmetic lessons are based to a considerable extent on the lines adopted in the Mental Arithmetic lesson which invariably precedes them. Mental Arithmetic here does not consist of a series of questions fired off at the class for the sole purpose of obtaining correct answers. The subject is *taught*. The questions are carefully graduated, and certain arithmetical principles underlie each question. The object of the teaching is to exercise the mental faculty and to induce readiness in calculation and a systematic process in dealing with the problems submitted.

The class subjects, Geography and English Grammar, deserve more than a passing word. The latter subject is taught on the same principles as those referred to in the teaching of Mental Arithmetic. Mental training is the first object. As Mr. Blenkinsop remarked:—'Establish a proper knowledge of how to utilise their mental capacities, and the instruction of the children naturally and without difficulty progresses.'

But if we were satisfied with the instruction in the subjects already dealt with, we were the more so with what we subsequently heard.

Repetition, especially in the upper standards, is most excellently rendered.

Standards V., VI. & VII., take selections from Shakespeare's 'As you like it,' and not only give a pleasing rendering of the parts committed to memory, but also display a commendable knowledge of the play itself.

Varied Occupations receive due attention in the shape of Colour Drawing, Clay Modelling, and Cardboard Modelling.

Colour Drawing is neatly executed, the designs being artistically coloured with crayons. Clay Modelling, an occupation of exceptional interest to the

Notes.—(a) The Girls take Sewing on Mondays and Thursdays from 1.30 to 2.50.
(b) Cookery for all Girls above Standard III. on alternate Thursdays from 9.30 to 4.
(c) Drill and Physical Exercises on Wednesdays.
(d) Girls attend the School of Art at which all the Teachers are present, is given every Wednesday at 3.45.
(e) A Criticism Lesson.
(f) Five minutes' Mental Arithmetic at commencement of each Arithmetic Lesson.

pupils, will before long be a prominent feature in this school, evidence of excellent progress being obvious. Models in cardboard, too, display cleverness and ability.

In all three occupations no popularly accepted method is adopted. The Leeds School Board employ a special instructor, under whose supervision the work is carried on.

Physiology is taken with both boys and girls as a specific subject.

The teaching of Scripture is, perhaps, the most noteworthy feature of the school. Mr. Blenkinsop has for many years been associated with the promulgation of religious instruction, and one needs but a slight acquaintance with his work in this direction to anticipate the character of the religious education in his school. We had before us several of the Inspector's reports on this subject, and they all speak in the highest terms of the instruction given. For example, let us quote from recent reports :—

'The instruction given by the teachers to their respective classes has been supplemented by the Head Master, and the results of the examination reflect much credit on teachers and scholars alike. The latter showed great earnestness in their work, and their knowledge of the Scriptures was wide and accurate.'

Again, 'The Scripture Instruction in this school has been well given.'

The same style characterises the whole of the reports received.

Mr. Blenkinsop believes in taking an active interest in his pupils outside school as well as in. A well-organised cricket club is managed by the scholars, and in winter-time the club devotes its energies to football.

A Savings Bank is also in connection with the school, and Mr. Blenkinsop thinks the trouble which this necessitates is adequately recompensed by the inculcation of thrift among the pupils.

A list of standard works occupied a prominent position on the wall. We were informed that this list is compiled from the catalogue of books in the Kirkstall Branch of the Public Library. The list is consulted by the scholars, and is periodically revised. In this manner the general reading of the scholars is arranged and supervised.

The reports of H.M. Inspectors on the work of Mr. Blenkinsop are of a very high order, but our limits will not allow of their reproduction.

The last report received, however, reads : —

'The order is good, and the scholars have done well in the examination, especially in Spelling, Composition, and written Arithmetic. Needlework deserves praise.'

Mr. Blenkinsop thinks the system of mixing the sexes in schools is a proper one. He claims for it educational advantages in the shape of finer tone, and the utility of the effect which may be realised by comparing the work of the sexes. He is convinced that a more chivalric spirit is infused into the boys, and a more self-reliant attitude is adopted by the girls, as consequences of their being taught together.

We have previously referred to Mr. Blenkinsop's connection with the work of religious instruction. He is a prominent Nonconformist, being a member of the Leeds Nonconformist Council and of the Methodist Free Church Council, and he also occupies the

position, by no means a sinecure, of Circuit Steward in the Lady Lane division of the Leeds Circuit.

As a lay preacher he has a considerable reputation, his popularity bringing him into request in all parts of the county.

He is an earnest advocate of the now popular P.S.A. movement, believing that this movement reaches persons who gladly listen to instructive lectures, but who have no inclination to endure prosaic sermons.

In addition to the immense amount of labour which these offices involve, Mr. Blenkinsop is actively interested in Friendly Societies. He is a Past Master of the Loyal Order of Ancient Shepherds, and was presented with his Regalia at the close of his year of office. He strongly supports the claims of Friendly Societies upon the general community.

Mr. Blenkinsop wishes that teachers would take more active parts in connection with other than strictly professional movements, and quoting from his own experience, he demonstrated how in many instances his connection with non-professional organisations had been of service in advancing the cause of education.

As a worker in the arena of professional politics, Mr. Blenkinsop is, perhaps, best known. His membership of the N.U.T. dates back to 1876, since which time he has been prominently associated with the Union. From 1877 to the present time he has held office on the Committee of the Leeds Association. He has been Secretary, Vice-President, and President of that large organisation. At the Leeds N.U.T. Conference he was brought prominently before the notice of representatives owing to the magnificent manner in which he had filled the office of Secretary to the Benevolent Purposes Committee. He is a Life Governor of the Teachers' Benevolent Fund, and a Life Member of the Orphan Fund. He has represented his association at the following Conferences:—Bradford, Birmingham, Cheltenham, Cardiff, Leeds, Liverpool, Oxford, and Manchester.

This fact is striking evidence of his popularity in the Leeds Association, where the honour of representing the association at Conference is keenly contested.

Mr. Blenkinsop is a prominent figure on the Council of the West Yorks District Union, with which organisation he was connected in the olden days prior to its resuscitation.

He is on the Committees of the Leeds Board Head Teachers' Association and the Leeds Teachers' Direct Representation Association.

He speaks eloquently on the principle of direct representation, and trusts that every important association in the country will ere long recognise the necessity for direct representation on local School Boards.

As a speaker, Mr. Blenkinsop is very effective, and is frequently before the local teachers' associations in West Yorkshire, engaged in proselytizing the cause of the N.U.T.

His cheery welcome, his open-hearted manner, and the energy and determination which characterise his methods of work, have won for him a host of enthusiastic friends and supporters. He is one of that class of pedagogues which happily, we have reason to believe, is becoming more numerous. We refer to that class of teachers who put the cause of education in the front rank of their life's programme, who spare no labour, no energy in the advancement of the cause, and who realise that as teachers they possess more than ordinary responsibilities as citizens.

Whether our visit to Kirkstall or the subsequent conversation which we had whilst enjoying Mr. Blenkinsop's hospitality were most appreciated is an open question; for no practical teacher can visit Kirkstall Board School without gleaning some valuable information, and the individual who cannot appreciate the value of Mr. Blenkinsop's experience when expressed in opinions on educational topics certainly has not undergone that mental training which Mr. Blenkinsop demands as an essential preliminary to educational instruction.

NEW PROBLEMS IN ARITHMETIC.

(SECOND SERIES.)

BY T. B. ELLERY, F.R.G.S.,
President of the National Union of Teachers.

4TH PAPER.

STANDARD VI.*—(1895 CODE).

THE first series having been well received, and the Editor's wish being law, the present series is submitted in the hope that teachers—especially the young and inexperienced—may derive some assistance in their heavy labours.

As I have said before, a number of the exercises may be found beyond some of the children in the Standard, but each will form the basis of a good lesson, and the whole set, carefully worked on the blackboard and by the children, will give excellent practice and help considerably in the preparation for the work of the next higher Standard.

For introduction see *The Practical Teacher* for October 1894, and for further particulars *The Girls' Mistress* for September 1st, in which issue appeared the first of a series of papers entitled *Standard Problems for Girls, and How to Solve them.*

The second series began with a set of tests for Standard III.

A.

1. The difference between two fractions is $\frac{1}{3\frac{1}{3}}$. The smaller is $\frac{2}{9}$. Take the other from $\frac{1}{1\frac{1}{3}}$.

2. What fraction of 3 crowns must I add to $2\frac{2}{3}$ of £·375 to make a guinea?

3. I buy apples at 2s. $7\frac{1}{4}$d. per hundred (125 to the hundred), and I sell them at a gain of 3d. a dozen. Find selling price of 50.

4. I gave £$3\frac{1}{15}$ for an article, and sold it again for £$3\frac{1}{16}$. How many dozen must I sell in order to gain £83·6?

5. A man pays 5s. 4d. per pound for tobacco, and each time he fills his pipe he uses $5\frac{1}{2}$ drams. How

* Excellent practice for pupil teachers and monitors.

many times can he fill his pipe from half-a-sovereign's worth of tobacco?

6. Four men's food cost as much as 5 boys' food. 3 boys' food cost in all 17s. $1\frac{1}{2}$d. What, at this rate, would it cost to provide food for 52 men?

7. What must a man lay aside every quarter of the year in order to pay his income tax, his gross income being three hundred guineas, and the tax being 8d. in the £? (He does not pay on the first £160.)

8. A pipe can fill a cistern in 4 minutes. The cistern has two pipes which can empty it in 8 and 16 minutes respectively. All are turned on together. In what time will the cistern be filled?

9. I divide a sum of money among A, B, and C. To A I give $\frac{1}{3}$ of the whole, and to B ·1875. C receives £6 8s. $7\frac{1}{2}$d. What is the sum divided?

10. A fruiterer bought 436 oranges at 4 a penny, and another lot at 5 a penny, paying in all 2s. 2d. less than a sovereign. How many did he buy at 5 a penny?

11. I gave 16 sheep and 60 cows in exchange for 72 horses. Each sheep was worth £2·25, and that was $\frac{1}{7}$ of the cost of a cow. Find the cost of a dozen horses.

12. A girl, after giving ·75 of her pocket money to her sister, then ·625 of the remainder to her brother, and then $\frac{1}{\frac{3}{5}}$ of what still remained to a friend, had one-third of a guinea left. What had she at first?

B.

13. A grocer paid £$3\frac{1}{2}$ for ·625 cwt. of tea. At what price per packet of 7 lb. must he sell it to gain ·125 of a sovereign on each packet?

14. A bankrupt pays 12s. 6d. in the £, and to one of his creditors he pays 250 guineas. What was the sum of money owing to that creditor at first?

15. A, B, and C put £350, £400, and £500 respectively into the bank, the interest paid being at the rate of $2\frac{1}{2}$ per cent. A kept his money in for 6 months, B for 8 months, and C for 9 months. Find the total amount of interest received.

16. A receives $\frac{2}{5}$ of an estate, B receives an amount equal to $\frac{2}{3}$ of A's share, C receives $\frac{1}{16}$, and D the remainder. If the value of D's share is £800, find the value of C's.

17. A draper bought 480 yd. of silk for £108. One yard in twenty was wasted. He sold the rest in parcels of 12 yards, and gained £63 on the whole sale. What did he charge for each parcel of 12 yards?

18. Two boys, X and Y, ran a race of 2·5 miles. X ran at the rate of 5·5 yards in 2 seconds, and Y at the rate of 2·75 yards in 1·5 second. Who won the race and by how much?

19. Divide 360 into three parts, such that the first shall exceed the second by 13, and the second exceed the third by 17·5.

20. $\frac{1}{3}$ of the boys in a school were in the 1st class, $\frac{1}{4}$ in the 2nd, and $\frac{1}{8}$ in the third. There were 55 boys in the fourth class and 25 fewer in the fifth. How many boys in the five classes?

21. A bag contained £19 18s. in gold and silver coins. There were 7 sovereigns and 3 half-sovereigns, and the rest was made up of an equal number of crowns, half-crowns, and florins. How many silver coins in all?

22. The income tax is increased from 6d. to 8d. in the £, and a man's payment is thereby increased by £3 6s. 8d. What is the income on which he pays?

23. A sum of money was divided equally among 18 men, and an equal amount was divided among a number of women. Each man received £$\frac{3}{5}$, and each woman £$\frac{1}{12}$ less than that. Find the number of women.

24. A sum of £39 1s. was made up by a certain number of boys. One-fourth paid £$\frac{1}{20}$ each, one-fourth £·0625 each, one-fourth £$\frac{1}{12}$, and the remainder £$\frac{1}{10}$ each. How many boys subscribed?

C.

25. Find the cost of carpeting a room, 36 ft. long and 24 ft. broad, with carpet $\frac{3}{4}$ yd. wide at 2s. 11d. a yard.

26. Find the cost of carpeting a room, 18 yd. long and 16 yd. wide, with carpet 1 ft. 6 in. wide at 3s. 6d. a yard.

27. Find the cost of papering a room, 48 ft. long, 36 ft. wide, and 15 ft. high, with paper a yard wide at $9\frac{1}{2}$d. a yard.

28. Find the cost of papering a room, 21 yd. long, 18 yd. wide, and 15 ft. high, with paper 2 ft. 6 in. wide at 1s. 6d. a yard.

29. A and B can do a piece of work in 2 days, B and C in $2\frac{1}{2}$ days, A and C in $1\frac{3}{4}$ days. How long would they take, working together?

30. A can do a piece of work in $3\frac{1}{3}$ days, B in $4\frac{1}{2}$ days, and C in 6 days. A works alone for 2 days, and then stops, and B and C are called in to finish the task. How long will these two take to finish it?

31. A gentleman left £3,000, which was $\frac{3}{10}$ of his estate, to each of his two sons, and he divided the remainder of the estate between his widow and daughter in the shares $2\frac{1}{2} : 1\frac{1}{2}$. What did the widow receive?

32. If ·35 of £$16\frac{2}{3}$ be divided among 6 boys and 4 girls, each boy receiving twice the share of a girl, how much will 2 boys and 3 girls receive in all?

33. A store of food would last a flock of sheep 120 days, but after forty days $\frac{3}{8}$ of the flock are sold. How long after will the store suffice for the rest?

34. A fruiterer bought twelve hundred oranges at the rate of 3d. a dozen. He afterwards threw away $\frac{1}{10}$ of the whole. Of the remainder he sold one out of every four at a penny each. Of those that were left then he sold one out of every five at a halfpenny each. The rest sold at 4 a penny. Find his gain.

35. If 48 sheep or 16 cows eat 40 bushels of turnips in 4 days, how many bushels will 36 sheep and 20 cows eat in three-fourths the time?

36. A gentleman left £3,600 to his widow. The rest of the estate was divided equally among his five sons, each of whom had one-eighth of the whole estate. Find the value of the estate?

37. A and B can do a piece of work in 20 days, A and C in 30 days, and B and C in 40 days. How long would B take to do it alone?

38. The sum of the ages of two brothers is 75. Twenty years ago their ages were as 4 to 3. Find their present ages.

39. A gentleman lent £600 at 2½ per cent., £400 at 3½ per cent., £500 at 4 per cent., and £500 at 4½ per cent. What did he receive as interest on each hundred pounds taking one with another?

40. £14 2s. is divided among 36 men, one-half that number of women, and 12 boys. For every 1d. a boy received, a woman received 3d. and a man 6d. What was a woman's share?

ANSWERS.

(1) $2\frac{43}{60}$.
(2) $\frac{1}{15}$.
(3) 2s. 1d.
(4) 8 dozen.
(5) 90 times.
(6) £18 11s. 0½d.
(7) £1 5s. 10d.
(8) 16 minutes.
(9) £10 10s.
(10) 525 oranges.
(11) £163 10s.
(12) £4.
(13) 9s. 6d. per packet.
(14) £420.
(15) £20 8s. 4d.
(16) £160.
(17) £4 10s.
(18) X, by 13 min. 20 sec.
(19) 134½; 121½; 104.
(20) 200 boys.
(21) 72 silver coins.
(22) £400.
(23) 20 women.
(24) 528 boys.
(25) £21.
(26) £100 16s.
(27) £11 1s. 8d.
(28) £35 2s.
(29) 1¼ day.
(30) $1\frac{1}{13}$ day.
(31) £2,500.
(32) £2 11s. 0½d.
(33) 128 days.
(34) £1 1s. 8½d.
(35) 60 bushels.
(36) £9,600.
(37) 48 days.
(38) 40 years; 35 years.
(39) $£3\frac{23}{40}$.
(40) 3s.

EDUCATION DEPARTMENT.

CIRCULAR TO H.M. INSPECTORS.—OBJECT TEACHING.

Circular 369.

Education Department,
Whitehall, London, S.W.,
25th June 1895.

SIR,

It has been observed that in schools in which Object Teaching has been introduced with most success the teachers have carefully distinguished between two kinds of instruction which in other schools are not seldom confused. These two kinds of instruction are—(1) observation of the Object itself, and (2) giving information about the Object. This distinction is of importance, because the scope and method of the lesson differ according to its nature. Object Teaching leads the scholar to acquire knowledge by observation and experiment; and no instruction is properly so-called unless an Object is presented to the learner so that the addition to his knowledge may be made through the senses.

Junior teachers have not unfrequently given lessons before H.M. Inspectors which were wrongly described as Object Lessons, because in dealing with the topic selected no suitable appeal was made to the eye of the scholar. A lesson, for example, on the elephant to children in village schools, who have no opportunity of visiting either Museums or Zoological Gardens, may convey information and store the memory with interesting facts, but it does not cultivate the habit of obtaining knowledge directly and at first-hand, or develop the faculty of observation. However well the lesson may be illustrated by diagrams, pictures, models, or lantern slides, if the children have no opportunity of handling or watching the actual object which is being dealt with, the teacher will be giving an Information Lesson rather than an Object Lesson. It should be always remembered that in Object Lessons the imparting of information is secondary to the cultivation of the faculty of observation.

Object Teaching should further be distinguished from Instruction in Natural Science. It is Elementary Science only in so far as it aids the child to observe some of the facts of nature upon which Natural Science is founded; but as it deals with such topics without formal arrangement, it differs widely from the systematic study of a particular science. The principles of scientific classification, the continuous study of one group of natural phenomena, the generalisation from facts and the search for natural laws, belong to a later stage of mental discipline, which will be much more effectual if it is being based upon the preliminary training of the senses through sound Object Teaching. It is most important, therefore, that if, for example, Object Lessons are given on plant life, no attempt should be made to treat them as a continuous introduction to the study of Botany, or, if the lessons relate to animal life, to the study of Zoology. In Object Teaching the chief interest in the lesson should centre in the Object itself.

The following suggestions, which have been made by practical teachers, will be found useful:—

(1.) The teacher should select only so many of the Objects set forth in the appended or other similar lists as can be dealt with in the year without overburdening the scholars. Habits of observation are better cultivated by the thorough examination of a few objects than by the superficial treatment of many.

(2.) No object should be chosen which the teacher cannot thoroughly illustrate either by the Object itself or by some adequate representation of the Object, or by both. All that is purely technical, whether in the mode of study or the language and terminology, should be carefully avoided.

(3.) The children should be encouraged to bring with them to the lesson illustrative specimens which they have collected or borrowed from friends.

(4.) The children should be encouraged to make simple drawings illustrative of their observations, wherever possible, and in certain cases to make simple records on square-ruled paper. Clay modelling and other manual occupations may be employed to test the accuracy of the impressions which the children form, and to fix them in their minds. Teachers also should frequently illustrate details of the lesson by blackboard drawings. Children who are jaded in five minutes by a lecture will be open-eyed and receptive for half-an-hour while the teacher draws as well as talks.

(5.) Visits to Museums and other institutions of educational value are now recognised by the Code, and may advantageously be undertaken where possible in connexion with the Object Teaching. Occasional class excursions out of school hours (or, if the instruction be in accordance with Art. 12 (*f*) of the Code, in school hours), under proper guidance, will enable teachers both to provide suitable Objects, and to confirm previous impressions. It should be borne in mind that Objects, when they are brought into the class-room, cannot be there studied under their ordinary conditions; and therefore it is important by a proper use of such expeditions to let the children see what part the Object plays in its usual surroundings.

(6.) If the scholars are to learn intelligently from their Object Lessons, the first requisite is trained attention. The right method of securing this is to direct, in a conversational way, the attention of the children to the different parts of the object in an orderly manner, and explain the relation of each part to the whole. After the analysis or study of separate detail, the object should be again treated as a whole. It should not be left in fragments, but the division into parts should be followed when possible by the reconstruction of them into their original unity. Through such teaching the vague and indefinite impressions which children receive from Objects when they are first presented to them are gradually converted into clear mental pictures.

(7.) The attempt to teach children to be accurate in observation cannot be separated from the need of making them accurate in description. After the children have been trained to observe a fact they should be practised in making a correct statement of it in a sentence of their own. This oral answering in complete sentences will lead to correct use of the English language, both in talking and writing, and will store the mind with a useful vocabulary. In the higher standards the children will be able to write brief weekly compositions in which they may express in a written form the ideas which they have acquired through oral instruction.

To sum up the main value of Object Teaching, there are three principal uses. The first and most important is to teach the children to observe, compare, and contrast; the second is to impart information; and the third is to reinforce the other two by making the results of them the basis for instruction in Language, Drawing, Number, Modelling, and other Handwork.

There are, however, other important uses of good Object Teaching. It makes the lives of the children more happy and interesting by opening up an easily accessible and attractive field for the exercise of brain, hand, and eye. It gives the children an opportunity of learning the simplest natural facts and directs their atten-

tion to external Objects, making their education less bookish. It further develops a love of nature and an interest in living things, and corrects the tendency which exists in many children to destructiveness and thoughtless unkindness to animals, and shows the ignorance and cruelty of such conduct. The value of the services which many animals render to man should be dwelt upon, and the importance of kindly treating them and preserving them should be pointed out. By these means, and in other ways, good Object Teaching may lay the foundation for the right direction of the activity and intelligence of the children throughout the whole school.

I have the honour to be, Sir,
Your obedient Servant,
G. W. KEKEWICH.

OBJECT LESSONS.

The following lessons deal with the ordinary phenomena of common life and with objects familiar to the children. The teacher's choice is not confined to these lists; other objects will be accepted subject to the approval of the Inspector. Any of the objects may be dealt with at the discretion of the teacher in more than one lesson, and although they have been grouped for convenience of reference, it is not intended to prescribe any specified number of them for a yearly course. With different treatment the same object may be adapted to more than one standard. Some teachers may prefer to deal with the same object in successive years, or to recur to it after a year's interval, expanding the study to suit the growing powers of the scholars. To meet the varying requirements of teachers it will be noticed that in some cases the names of the objects have been merely enumerated, while in other cases a few suggestions have been added as to the mode of treatment.

I.—PLANT LIFE.

(*a*) *The study of plants as growing things.*

Grow an onion in a bottle of water and note appearance of root and stem. Make a model in clay of the various stages of growth at short intervals.

Grow mustard seed on damp flannel and note stages of growth.

Notice a few curious roots.

The carrot. Cut off the top of one and grow it in a saucer of water. Contrast the root of a daisy (fibrous).

Roots which walk. Strawberry or strayberry.

Violet root.

Contrast root of Iris and Solomon's Seal in their modes of extension.

Stem. Count the rings in a trunk that has been felled. Rings, how produced; estimate age of tree; the record of wet or dry seasons.

Climbing stems. Ivy.

Train bindweed up a stick and note that it turns to the right. If you unwind it and force it the other way (to the left) note how it resumes its old direction again, holding the stick with one of its leaf stalks to get a purchase for the change.

Simple experiments to show effect of light on (1) leaves and (2) roots. Celery; blanching.

Leaves of deciduous trees contrasted with leaves of evergreens. Contrast leaves of holly, ivy, and box with leaves of oak, elm, and beech.

Note autumn tints. Collect and press leaves of various colours in autumn.

Buds. Leaf buds and flower buds.

Parts of a flower.

Fruits. Different kinds.

(*b*) *Blossoms, Fruits, Seeds, and Leaves.*

Parts of a flower.

Flowers of curious shape.

Pea blossom.

Insects and flowers.

Colours of flowers and insects.

Fruits. How seeds are scattered.

Shooting seeds.

Flying seeds.

Curious flowers, *e.g.*, primrose; compound flower (daisy); water lily.

Leaves. Shape, veining, arrangement.

Flowers as supplying (1) weather-glass, (2) clock, (3) calendar.

Examine celery plant. Cut leaf stalks into thin sections to see how a plant is built up.

(*c*) *How plants are adapted to their surroundings.*

A bunch of spring flowers (according to time of year).

A bunch of summer flowers ,, ,,

A bunch of autumn flowers ,, ,,

Flowers and the soil. Bog plants.

Riverside plants.

Plants that grow in running water.

Plants that grow in still water.

Meadow plants.

Plants of the heath and moor.

Plants of the hills. Plants of the wood. Plants of the sea-coast and salt marshes.

Sundew and flesh-eating plants.

Ferns.

The spores of ferns.

Grow some spores in a pan under glass and watch growth and development of a fern. Contrast with growth of mustard from seed.

Mosses.

Lichens.

Funguses.

Simple experiments in manuring plants.

How plants help or hinder each other's growth.

Parasites. Mistletoe.

Plants which help or injure man.

II.—ANIMAL LIFE.

(*a*.)

The Cat (compare with Dog).—Eyes, rough dry tongue, soft pads and sharp claws, teeth, method of holding prey, drinking, covering of fur, whiskers, tail.

The Cow (compare with Sheep and Goat).—How she takes her food, teeth, chewing, milk (cheese and butter), tail, hoofs, covering, ears, horns, nose.

The Horse (compare with Donkey).—Covering, teeth, hoofs, tail, mane.

The Rabbit (compare with Hare).—Teeth, legs, feet, claws, covering, tail, whiskers, ears, eyes.

The Mouse (compare with Rat and Water Rat).—Teeth, paws, tail, whiskers, eyes, ears.

A Fish.—How fitted to live in water, weight, shape, covering, temperature, movements.

A Plaice (compare with Herring).—Flat, eyes on one side of head, gills, movements.

Animals which sleep in winter.—Examples: squirrel, dormouse, common snake, frog, toad, snail, slug. Preparation made for sleep.

(*b*.)

Mole.—Shape, snout, teeth, paws, claws, eyes, ears, fur, food.

Hedgehog.—Covering of spines, how it rolls itself into a ball and why, head, teeth, food.

Common Snake (compare with Viper.)—Shape, covering, teeth, how it moves, how it swallows its prey.

Frog (compare with Toad and Newt).—Movement, capture of prey, breathing, winter quarters.

Garden Snail (compare with Slug).—Shell, mantle, head, horns, eyes, food, preparation for winter sleep.

Earth Worm.—Shape, rings, locomotion, food, usefulness.

Spider (contrast with Bee).—Shape, segments, legs, eyes, jaws, spinnerets, web, breathing organs.

(*c*.)

Paws and Claws and their uses.—Cat, dog, rabbit, mouse, mole, frog.

Tails and their uses.—Horse, cow, donkey, dog, cat, monkeys, harvest mouse.

Tongues and their uses.—Cat, dog, cow, woodpecker, frog.

Teeth and their uses.—Man, cat, cow, horse, rabbit, snake, fangs of poisonous snakes.

Hair, Fur, Wool, and their uses.—Cat, mole, dog, sheep, fox.

Beaks of Birds and their uses.—Duck, fowl, parrot, sparrow, goat-sucker, heron.

Feet of Birds and their uses.—Duck, fowl, swift, owl, etc.

Insects.—Examples: bee, beetle, butterfly, cockroach, silkworm. Insect development—legs, wings, segments, mouth, breathing apparatus, ovipositors.

III.—THE SKY, THE AIR, THE SURFACE OF THE LAND, AND WATER.

(*a*.) *The Sky.*

Sunrise, noon, and sunset. (Note the object over which the sun is seen to rise from month to month. Note sun's position at noon, and its varying height above horizon.)

Shadow. (Note by aid of a spike erect on a flat disc the varying length of the shadow at noon. Study the shadows of objects. Variation in sharpness and depth.)

Moon. (Note the changes. Draw the shape from week to week.)

A few of the brightest constellations. (Make diagrams on square ruled paper from a study of the sky itself. Great Bear and Pole Star; Lyre and Vega; Cassiopeia.)

Planets. (Note any planet visible when the lesson is given. Mark its position on square ruled paper for a few weeks.)

Varying length of day and night.

(*b.*) *The Air.*

Wind. Varying direction. (Note and keep record of the direction of the wind from day to day.)

Warmer and colder winds; rainy and dry winds.

Moisture in the air shown by seaweed; string (changing tension).

Wet cloth dries in the wind (water turns to vapour).

Vapour turns to water. (Breathing on slate. Clouds on hills. Evening mists.)

Clouds in the sky. Three chief kinds: 'heaps,' 'beds,' 'feathers.'

Rain. (Note size of drops. Raindrops on dust form little balls. Note effect of heavy rain in tearing up roads. Note the channels so made, and the arrangement of the sand and pebbles washed to a distance.)

Rainbow. (Note the succession of colours. Note position of sun behind observer and of the bow where the shower of rain is falling. Note that height of arch changes. When is it higher and when lower?)

Rainbow colours on shells, film of tar, etc. Feathers of birds.

Dew. (Note when formed. Cloudless weather. On what does it lie thickest?)

Hoar frost.

Snow. (Note size of flakes. Movement of flakes in the air as they fall. Snowdrift. Snow squeezed into ice.)

Hail. (Note when it falls. Examine hailstones. Is the hail accompanied by thunder?)

Thunder and lightning.

(*c.*) *The Surface of the Land.*

Level or sloping. Simple way of measuring slope. Height of School and neighbouring hilltops above sea-level.

Flow of water over the land. Neighbouring stream or streams. Water-partings.

The river basin in which the school is situated.

Construct a model fountain and make simple observations on the pressure of water. Milldam. A 'head' of water. Notion of falling water as a motor.

Soils. Clay, sand, slate, granite, chalk, quarries near school, gravel pits, clay pits, brick works. (Note how the rocks lie, in layers or in masses without structure.)

Stones in the brook, water worn; pebbles on beach, rounded; pebbles in gravel pit often with sharp edges, perhaps iceborne.

Difference between sand and mud. Crumbling rocks. Effect of frost on damp rocks.

Caves by the sea formed by the waves; caves inland formed by rain dissolving limestone; stalactites. (A lesson for schools in limestone regions or near rocky coasts.)

Building stone, marble, slate, Bath stone, sandstone, etc.

In marble, note shells, etc. Note plants in coal.

Volcanic rocks. Lava, brimstone, pumice stone, basalt and whinstone. (According to the nature of the district.)

Rock salt; crystals of salt. Salt in sea water. Mineral in solution.

Hard and soft water. Rain water compared with streams from chalk or limestone; leavings after evaporation. Fur in kettles. Softening hard water.

(In certain districts) other minerals in solution, sulphur wells, iron springs, medicinal waters.

Mortar and cement. (Slake lime and make mortar; note the heat, etc.)

Surface soils. Crumbled rocks. Waterborne sand and mud. Vegetable mould and earthworms.

Vegetation and cultivation. Forest, moor and heath. Heathers.

Hedgerow trees, elms, ashes.

Trees of the forest, oak, beech, birch.

Evergreen trees, pines and firs.

Evergreen plants and shrubs, holly, ivy, box. Contrast evergreen and deciduous leaves. (Note changes at fall of leaf. Autumn tints. Press specimens.)

Riverside trees, willows, poplars, aspens.

Hill pastures and meadows. Turf on the downs and hay in the valleys.

Gardens and their contents. Garden fruits and wild fruits. Garden flowers and wild flowers.

(*d.*) *Water.*

Standing water; ponds; pond life.

Springs and running water. Clear water looks shallower than it is. Simple experiments in illustration.

Study of flow of a stream. Where the flow is quicker (*a*) in the middle; (*b*) on one side, outer and inner bend. Where the bank is eaten away and where sand is spread out. Varying bottom; deep pools, shallows, sand banks. Confluence of tributary. Delta. Measure the speed at which the water flows.

Study of seashore. Rocky and sandy coasts. Soundings. The rise and fall of the tide. Currents. Drifting sand. Effect of frost on cliffs. Breakwaters. Layers of soil and rock exposed down the side of a cliff.

Measure with thermometer the temperature of (*a*) a spring; (*b*) a stream; (*c*) a pond; (*d*) the sea.

Ice. Study hardness, mode of fracture; splitting blocks with a needle. Does it sink or swim in water? Easy to make two surfaces of ice freeze together. Simple experiments with ice.

Watch and record behaviour of thermometer plunged in melting ice.

Melt some ice carefully to find out whether it takes up more or less room than the water into which it changes. (Force a mass of ice into a lump of clay and let it melt there.)

Freeze some water in a bottle and note bursting of bottle. Bursting of pipes.

Notes on expansion and contraction of substances illustrated by behaviour of water at different temperatures. Preliminary notion of thermometer.

Watch cold spring water being heated to boiling point in transparent glass vessel. Note bubbles of air given off, and as the water is heated bubbles of steam rising from below. Observe force of compressed steam. Preliminary notion of steam engine.

Dribble powdered alum into clear water. Hang thread in the solution and note the formation of crystal. Alum and other crystals.

Expose to the air crystals of (1) salt; (2) soda. Note change. What difference? What difference according to weather? Expose to the air crystals of saltpetre, and note result.

Dribble salt into clear water and note that it dissolves, quicker at first, then slower, at last no more is dissolved. Place a fresh egg in saturated solution and afterwards transfer it to clear water.

One liquid is denser than another. Compare water and mercury. Things which float in mercury and sink in water.

Upward pressure of water on bodies dropped into it. Why bodies sink or float. Why steel ships float. Why cork floats.

Simple experiments in displacement of water.

Simple experiments in pressure of water and pressure of air. Siphon. Squirt. Pump. Diving bell.

Distillation of water. Filtration.

Water; a combination of two gases, oxygen and hydrogen. Simple experiments.

IV.—Object Lessons for Town Schools.

(*a.*)

The water we drink—how obtained.

Some of the simpler properties of water.

River (or canal)—according to circumstances.

Boats, barges, or ships, with which children are familiar—according to circumstances.

Other ships, *e.g.*, Atlantic liners.

Bricks—their size, shape, and manufacture; their size, etc., to be ascertained by children's measurements.

Bricklayer's work—arrangement of bricks in 14-inch wall and in 9-inch wall, shown with real bricks or with small wooden ones; mortar, etc.

Coal—its simpler properties.

Coal—how obtained.

Coal—how transported and how used.

Coal-gas; it may be made in presence of the children.

Gasworks and gaspipes.

Petroleum—how obtained; its simpler properties and uses.

Lamps and their dangers.

Common stones used in building and road-making.

Road-making and paving.

Quarries and quarrymen.

Railways—general sketch.

Engines and carriages.

The work of railway men.

The park or public garden—general sketch.

The park or public garden—one or two of its more conspicuous trees.

The park or public garden—one or two of its more conspicuous plants.

Comparison between calico and flannel.

Cotton and its manufacture.

Lancashire and the cotton district; mills.

Sheep-clipping and rearing.

The West Riding of Yorkshire; factories, etc.

(*b.*)

Cart-horse.
Donkey.
Sparrow.
Rat or mouse.
Cat.
Plants grown in schoolroom (acorn in glass of water).
Plants grown in schoolroom (mustard and cress).
Plants grown in schoolroom (hyacinth in water or pot).
Plants grown in schoolroom (a fern).
Costermonger and what he sells.
Some common fruits sold in streets or shops, *e.g.*, pears and apples.
Some common fruits sold in streets or shops, *e.g.*, strawberries.
Some common fruits sold in streets or shops, *e.g.*, oranges.
Some common fruits sold in streets or shops, *e.g.*, cocoa-nuts.
Things seen in grocer's window, *e.g.*, tea.
Things seen in grocer's window, *e.g.*, sugar.
Things seen in grocer's window, *e.g.*, coffee.
Things seen in grocer's window, *e.g.*, currants and raisins.
The baker and his work.
The milkman.
The addressing and posting of a letter.
The postman and Post Office.
The sweep and his work.
Dangers from fire and how they may be avoided.
The fireman and fire-engines.
'Bus or tram drives.
The policeman.

V.—Object Lessons for Country Schools.

(*a.*)

The farmyard. Its buildings and their contents. Animals kept on a farm and their uses. Necessity of cleanliness, kindness, and suitable food.

The dairy and its contents. Butter and cheese-making.

Bees. Bee-keeping.

Spring. Spring flowers. Work in the fields in spring. The cuckoo and swallow. Record date of arrival.

Summer. Different kinds of leaves and fruit. Work in the fields in summer.

Autumn. Work in the fields.

A mill and the work of a miller.

Winter. Frost. Ice. Snow.

Birds. Singing birds, as the thrush and nightingale. Birds of prey, as the hawk. Swimming and wading birds, as the duck and heron.

Wild Animals. The fox, hare, and rabbit.

Minerals. A mine. Three useful minerals.

The lessons on the seasons should correspond with the actual seasons of the year, and the different operations explained should be taken while each is in progress.

Leaves of trees may be dried by simply placing them between sheets of paper and pressing them. Their shapes may be used for the children to draw round on paper, which can afterwards be pricked and then sewn round.

(*b.*)

Springtime.
- The waking of Nature.
- The lengthening daylight in the morning and evening, the coming warm weather, birds singing, building their nests, laying their eggs, the trees and hedges changing, buds and leaves, the bloom on fruit trees.

The local wild flowers of spring. The daisy, primrose, bluebell.
Summertime.
The local wild flowers of summer.
Autumn.
The local wild flowers of autumn.
Winter. The repose of Nature.
The land. Woodland, meadowland, ploughland, moorland.
The sky.
A bird—covering, wings, beak, feet; motion; nests, eggs, food.

Local birds.
- Thrush or blackbird.
- Lark.
- Robin.
- Rooks.

Birds which come for the summer.
Birds which come for the winter.

Local wild animals.
- Rabbit.
- Hare.
- Fox.
- Hedgehog.

Animals on a farm.
Our village.
The carrier's cart.
The cottage garden.
The stream or river, its banks, the birds and animals that live near it.
A fish.
A plant.

(*c.*)

The garden in spring.
The farm in spring.
The garden in summer.
The farm in summer.
The garden in autumn.
The farm in autumn.
The garden in winter.
The farm in winter.
The weather and wind.
The soil; sunshine, air, rain, frost, manure.
The farmer's tools. The plough, drill, reaping machine.
The crops; grass, corn, root-crops.
Wheat.
The potato.
The oak tree.
The elm tree.
The apple tree.
Evergreen trees.
An insect.
The spider and his web.
The butterfly; colours, beauty, history.
Bees.
The farmer's pests.
The farmer's friends.
A pond.
A frog.
A ramble in a wood and what may be seen there.
The railway.
Market-day in the neighbouring town.
A newspaper.

VI.—Object Lessons in the Science of Common Things.

(*a.*)

Water.—How carried, jugs, bottles, barrels, spouts, funnels. Wells. Things that float, things that sink.

Solids.—Hard and soft, in the room and in clothing. Files. Hammer and nails. Buttons.

Powders.—Flour.

Pastes.—Paste, clay, putty.

Things porous.—Bread, sponge.

Things that melt.—Butter, tallow, sealing-wax. Ice, snow.

Water.—Drying clothes, breathing on slates, frost on the pane. The boiling of the kettle. The pot boiling over.

Things that dissolve.—Sugar, salt.

Air.—Bubbles, pouring water through funnel into empty bottle. A burning candle. Fans, blowing feathers. Paper windmills.

Forms of strength.—The floor, joists and boards. Wooden bridges. Steps and stairs.

Things that stretch.—Elastic bands.

Things that bend.—Bow and arrows. Cord, ropes.

Machines.—Tops. Roller for pastry, for garden. Perambulator.

Movements.—Walking, running, leaping, creeping, crawling.

Musical Toys.—Harmonicon. Bell.

(*b.*)

Water.—Pipes, taps, the fountain. Canals. Rafts, boats, anchors.

Solids.—Teeth, nails and claws. Sand-paper. Pins, needles, awl, gimlet. Hook and eye.

Powders.—Chalk, pencil.

Pastes.—Mud in streets, brickmaking.

Things porous.—Brick, chalk, springs of water.

Things that melt.—Candle-making. Icicles.

Water.—Manufacture of salt from brine. Rain-drops, hail, spray, water-dust, the cloud.

Things that dissolve.—The manufacture of sugar.

Air.—The chimney, draughts. Waves and breakers. Winged seeds. Shuttlecock, arrow and kite.

Forms of Strength.—The ceiling. The arch. Ladders.

Things that stretch.—A football.

Things that bend.—Cart springs. Paper clips. Spider's web.

Machines.—Hoop, fly-wheel of sewing machine. Mangle, Waggon. Bicycle.

Movements.—Swimming.

Musical Toys.—Musical box. Drum.

(*c.*)

Water.—Syphon, pump. Oil, cream.
Solids.—Hinges, tires, and axles. The grindstone. Screws and screwdrivers.
Powders.—Black lead.
Pastes.—Pottery.
Things porous.—Blotting paper, towels, wicks, earth.
Things that melt.—Lead, iron.
Water.—Salt Lakes. Distillation of water. Clouds and rain.
Things that dissolve.—Crystals, hard water, varnishes.
Air.—The pop-gun, the fire-engine. Winds. A sailing ship.
Forms of Strength.—The roof. Railway bridges. Cranes.
Things that bend.—Clock spring. Chains.
Machines.—The loom. Threshing machine. Rolling iron rails. Coining.
Movements.—Flying.
Musical Toys.—Tin whistle. Sounds from stretched cord.

VII.—Measuring, Weighing, and Testing.

A two-foot rule.
Measurements of length—first by eye, then with rule. } Measurements in inches only.
Easy measurements of a square—first by eye, then with rule. } Measurements in inches only.
Easy measurements of rectangles.
The wire-gauge.
Callipers.
Scales and weights.
Weighing of common objects—first by hand, then with scales; weight in ounces only.
Weighing letters.
Plumb-line.
Spirit level.
Steam—observations on boiling water; condensation of steam, etc.
Mercury—weight of; *cf.* drop of mercury and drop of water; effect of heat on mercury.
Alcohol—effect of heat on it; its evaporation.
Thermometer, its manufacture.
Thermometer—uses; readings in ice, in boiling water, under the tongue, in schoolroom.
A candle—its composition. The wick.
Candle under bell-jar over water; candle in narrow-necked bottle.
Chalk—where found; its origin.
Chalk—its treatment with acid.
Chalk—its reduction to quicklime with blow-pipe; lime-water.
Sugar heated in test-tube; wood heated in test-tube.
Sulphur heated in test-tube; lead heated in test-tube.
Magnet and iron filings.
The compass.

MENTAL ARITHMETIC FOR THE STANDARDS.

BY T. B. ELLERY, F.R.G.S.,
President of the National Union of Teachers.

'*Mental work will strengthen the power of computation, and facilitate the handling of simple problems.*'—Mr. Codd, H.M.I.S.

Third Paper.

Infants and Standard I.—*Continued.*

Up to the present we have dealt with numbers not exceeding 20, adding, subtracting, multiplying, and dividing. In many schools it is still the custom to teach boys to add to, say, 40 or 50, and even to 100, before subtraction is attempted, while simple exercises in multiplication and division are not even thought of.

That this is a serious mistake all practical and successful teachers of arithmetic will agree.

Variety of exercise is an encouragement and a considerable help to the children, who are more likely to continue interested in their work, if agreeable changes are introduced, than if they are kept hammering away at one kind of exercise all the week through. Let us then for the present, at least, select small numbers, and deal with them in every possible way.

The work of Standard I. (Scheme B), as set forth in the 1895 Code, is admirably arranged. The four simple rules are required, but divisors and multipliers are not to exceed 6, and no number higher than 99 is to be employed in the questions or required in the answers. That will form an excellent Mental Arithmetic Scheme for ourselves, but I propose exceeding the limit by 1. The number 100 should, I think, be included, though, of course, one knows why 99 was chosen.

We have travelled as far as 20; let us go on to 30, 40, and 50.

21 is 20 + 1; 22 is 20 + 2; 23 is 20 + 3; and so on to 30. Our pupils know that 2 + 4 is 6, and now we have 22 + 4 is 26. 3 + 5 is 8; 23 + 5 is 28. 6 + 3 is 9; 26 + 3 is 29. 5 + 5 is 10; 15 + 5 is 20; 25 + 5 is 30. This last step is a very important one. Similarly, with subtraction, 1 from 2 is 1; 21 from 22 is 1; 2 from 6 is 4; 22 from 26 is 4; 5 from 10 is 5; and 15 from 20 is 5; 25 from 30 is 5; and so on.

Then pass on to 18 + 12, taking care to show that the sum of the units is 10; 17 + 9; 17 + 13; 16 + 8; 16 + 10; 16 + 14, etc., etc.

Multiplication.	*Division.*
Twice 11 is 22	2 into 22 will go 11 times.
12 „ 24	„ 24 „ 12 „
3 times 7 „ 21	3 into 21 „ 7 „
8 „ 24	„ 24 „ 8 „
9 „ 27	„ 27 „ 9 „
10 „ 30	„ 30 „ 10 „
4 times 6 „ 24	4 into 24 „ 6 „
7 „ 28	„ 28 „ 7 „
5 times 5 „ 25	5 into 25 „ 5 „
6 „ 30	„ 30 „ 6 „
6 times 4 „ 24	6 into 24 „ 4 „
5 „ 30	„ 30 „ 5 „

The pence and shillings tables should be carried from 20 to 30.

	s.	d.		£	s.
21 pence	1	9	21 shillings	1	1
22 „	1	10	22 „	1	2
to			to		
30 pence	2	6	30 shillings	1	10

And, as I have already suggested, combine the tables thus:

	s.	d.		£	s.
4 times 5 is 20 =	1	8	5 times 4 is 20 =	1	0
„ 6 „ 24 =	2	0	„ 5 „ 25 =	1	5
„ 7 „ 28 =	2	4	„ 6 „ 30 =	1	10

and so on.

The children will then be ready for such exercises as the following:—

1. Add 9, 8, 10.

2. Take 16 from the sum of 14 and 12.

3. What must you add to 5 times 5 to make 4 times 7?

4. I want to give 4 apples to each of 3 boys and 3 girls. How many apples must I buy?

5. How many half-dozens are there in 24? in 30?

6. Take 13 from the sum of 14 and 15.

7. Add 6, 11, 7, 5.

8. Take 3 fives from 2 dozen.

9. 21 pence? 26 pence? 29 pence?

10. 18 pence? 23 pence? 28 pence?

11. 23 shillings? 26 shilling? 29 shillings?

12. What must you add to 18 pence to make 2s.? 2s. 6d.?

13. How many times is 3d. contained in 2s.? in half-a-crown?

14. How many times is 1½d. contained in 3d.? in 1s.? in 1s. 6d.? in 2s.? in 2s. 6d.?

15. Take eleven from the sum of 18 and 12.

16. A man spent twelve pennies at one shop, six at another, seven at another, and three at another. How many did he spend in all?

17. Take two dozen from the sum of 17 and 13.

18. A man bought five apples at a penny each, and four pears at two pence each. What change would he receive from half-a-crown?

19. Three boys had each 6 pennies, and four others had each 3 pennies. How many pennies in all?

20. How many fives are there in the sum of 13, 9, and 8?

(The Teacher will, of course, give scores of similar exercises.)

We pursue the same methods to 40, and then to 50, every step being thoroughly taught before the next is attempted.

To 40.

	s.	d.			s.	d.
4 times 8 is 32 =	2	8	5 times 7 is 35 =		2	11
„ 9 „ 36 =	3	0	„ 8 „ 40 =		3	4
„ 10 „ 40 =	3	4				

	s.	d.		£	s.
6 times 6 is 36 =	3	0	*and* 6 times 6 is 36 =	1	16

and so on.

	£	s.
31 shillings =	1	11
32 „ =	1	12
to		
40 „ =	2	0.

21. How many sixes in three dozen?

22. Add 18, 7, and 13.

23. Take seven from six times six.

24. How many must you add to 4 times 4 to make 6 times 6?

25. What must you add to five times 3 to make six times 5?

26. A man offered to give 4 apples to each of 10 boys, but found he had only two dozen and a half. How many more must he buy?

27. What change shall I receive from 3s. after paying for 4 books at 8d. each?

28. How many half-dozens are there in 36?

29. Take the sum of 8, 9, 10, and 11 from 40.

30. Multiply 8 by 5, and then divide your answer by 4. Etc., etc.

To 50.

	s.	d.		s.	d.
4 times 11 is 44 =	3	8	5 times 9 is 45 =	3	9
„ 12 „ 48 =	4	0	„ 10 „ 50 =	4	2

	s.	d.		£	s.
6 times 7 is 42 =	3	6	*and* 6 times 7 is 42 =	2	2
„ 8 „ 48 =	4	0	„ 8 „ 48 =	2	8

and so on.

	£	s.
41 shillings =	2	1
42 „ =	2	2
to		
50 „ =	2	10

Splendid practice can be provided for children with numbers up to 50.

Let them see how the number is built up—5 tens, 10 fives, 25 twos, &c.

IIIIIIIIII IIIIIIIIII IIIIIIIIII
IIIIIIIIII IIIIIIIIII
(5 tens.)

IIIIIIIIIIIIIIIIIIII IIIIIIIIIIIIIIIIIIII
IIIIIIIIII
(2 twenties, and ten towards another twenty.)

IIIII IIIII IIIII IIIII IIIII IIIII
IIIII IIIII IIIII IIIII
(10 fives.)

Use the ball frame, pieces of chalk or pencil, books, nuts—anything, in fact, that can be used for such a purpose. We have reached 50 pence = 4s. 2d. Show the children four shillings and two pence; 4 shillings; 8 sixpences; 16 threepences; 48 pence, and as many other coins (up to the 50 limit) as possible.

Let this practice be carried on at every arithmetic lesson.

4 fives? 6 sevens? 6 eights? 5 nines? 18 and 18? 18 and 28? 17 and 15? 17 and 25? 19 and 13? 19 and 23?

How many fives in 30? in 35? in 40? in 45? in 50?

How many fours in 28? 48? 32? 40? 36?

How many sixes in 24? 48? 24? 36?

Add 8, 9, 13, and divide your answer by 5 and by 6.

How many sixpences would you give in exchange for 2s.? 4s.? 3s.? 2s. 6d.? 3s. 6d.?

31. What must you add to 30 to make 40? to make 50? What is the half of 50?

32. Take five *sevens* from six *eights*.

33. A lad had 18 marbles in one pocket and 24 in another. To how many boys could he give six each?

34. I gave eleven nuts to each of 4 boys and had 4 left. How many nuts had I at first?

35. 27 pence? 37 pence? 49 pence? 23 pence? 39 pence? 47 pence?

36. I gave 4 shillings to each of 8 men, and 2 shillings to each of six men. How many shillings did I give away?

37. How many boys can each receive five apples out of 3 bags, each containing 15?

38. Take 13 from 42, and add three sixes to your answer.

39. I bought 3 books at 6d. each, and 6 at 4d. each. How much did I spend? What change from 4s.?

40. How many pennies shall I require to give 4 to each of 5 boys, and 3 to each of 5 girls?

41. There are 16 apples in one basket, 10 in another, and 9 in another. I divided these equally among 5 girls. How many each?

42. Take the sum of 8 and 9 from 6 times 8.

43. What must you add to 3 *eights* to make six times six?

44. I bought 24 apples at 3 a penny. How much less than 1s. did I spend?

45. I bought 50 oranges at 5 for 3d. How much less than 3s. did I spend?

46. I bought 40 oranges at 4 a penny, and 48 pears at 2 a penny. How many pennies did I spend?

47. Tom had 6d., Fred had twice that sum, and Harry had as much as Tom and Fred together. How much had they in all?

48. Take $8\frac{1}{2}$d. from 1s. 8d.; $6\frac{1}{2}$d. from 3s. 6d.; 1s. $1\frac{1}{2}$d. from 2s.; 3s. $2\frac{1}{2}$d. from 3s. 6d., and from 4s.; 2s. $10\frac{1}{2}$d. from 3s. 6d., from 3s. 10d., and from 4s.

49. How many shillings and pence in 35 pence? 29 pence? 47 pence? 37 pence? 25 pence? 49 pence?

50. I gave 1s. $7\frac{1}{2}$d. for one article and 1s. $4\frac{1}{2}$d. for another. How much more than half-a-crown did I spend?

[Our next Paper will deal with numbers to 100, and the pence and shillings tables up to the same limit.]

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Head Master of the Belvedere Pupil Teachers' Centre, First on Scholarship List, Author of 'Scholarship School Management.

PUPIL TEACHERS' COURSE.

SCHEME OF WORK FOR THE MONTH.

A.—*English.*

NEW BOOKS.

Messrs. Macmillan have issued capital editions of 'The Traveller' and Gray's two poems, with the fullest notes. They are undoubtedly the best that have yet appeared.

Thompson's Algebra. Joseph Hughes & Co., 2s. 6d.

We recommend all those taking Algebra to get this book without delay.

Written specially for P.T.'s and Scholarship Students, the greatest attention is paid to the all-important subject of Factors. The Theory is carefully explained, and the exercises copious. We shall set work from this book in future.

First Year.

1. Revise the Grammar of the Parts of Speech. Look over the test questions given in Beach and Daniel.
2. Learn, or carefully revise if learnt, the Greek Prefixes.
3. Learn 50 roots and meanings from Beach, Daniel, or any good list.
4. Gray's 'Bard.' Prepare lines 111 to end. Learn meanings of all allusions and references, and be prepared to analyse any part and parse any word.

See note below.

Second Year.

1. Prepare thoroughly the syntax of the Adverb and Preposition (Beach, 119–122; Daniel, 206–216).
2. Revise any prefixes not thoroughly known.
3. Learn 50 roots and meanings from Beach, Daniel, or any good list.
4. 'The Traveller.' Prepare lines 334–430.

Learn meanings of all allusions. Be prepared to paraphrase and analyse any part and parse any word.

Third Year.

1. Learn brief lives of the following authors, and a list of their chief works:—Goldsmith, Hume, Adam Smith, Burke, Burns, Cowper, Crabbe, Southey, Wordsworth, Scott, Coleridge, Lamb, and Campbell.
2. Learn 50 roots with meanings and examples.
3. 'Essay on Man.' Prepare lines 232 to the end. Summarise the argument. Be prepared to paraphrase and analyse any part and parse any word.

See note below.

If any difficulty is experienced, write for assistance.

Important.—At the request of several readers we addressed a query to the Department as to whether the exercises in Grammar will in October be taken from the prescribed books. We have received this reply:—'In answer to your letter I am directed to state that the passages for Recitation may be selected from authors approved by H.M. Inspectors, *but the passages for Parsing, Analysis, and Paraphrase will be taken from one or other of the books named for the year.*'

As considerable doubt seems to exist upon this point, P.T.s are advised to particularly note this.

B.—*Arithmetic.*

First Year.

Boys.—Read up the Theory of Recurring Decimals.

Note particularly methods of Adding, Subtracting, Multiplication, and Division, without reducing to Fractions.

Work as many exercises as possible. Work:—Lock, Ex. XCI.; Barnard Smith, Ex. XLVII., Sections 7 to 12; Dixon and Beach, Ex. XX.

Girls.—Work:—Dixon and Beach, Ex. XI.; Lock, Ex. LIX.; Barnard Smith, Ex. XLVII., Sections 1–6.

Second Year.

Boys.—Work:—Dixon and Beach, Ex. XXXV.; Lock, Ex. CXLV., Nos. 1–200 (selecting only those which present difficulty); Barnard Smith, Ex. LXIII.

Girls.—Revise any theory that may require attention, especially that of Ratio and Proportion. Work any examples bearing on the work.

Third Year.

Boys.—Work:—Barnard Smith, Ex. LXX., Sections 5–8; Lock Ex. CXLV., Nos. 411–463.

Girls.—As the whole of the work has now been covered, attention should be directed to any point or rule which is weak. Send up any difficulties for solution.

MODEL SOLUTIONS TO SOME OF LAST MONTH'S SUMS.

Second Year.—Boys.

(1) If the proportion of work of a man, woman, and child be 3 : 2 : 1, one man = 3 boys, one woman = 2 boys; then reducing all to boys,

12 men, 15 women, and 15 boys = 12 × 3 boys + 15 × 2 boys + 15 boys = 81 boys; and 18 men, 12 women, and 12 boys = 18 × 3 boys + 12 × 2 boys + 12 boys = 90 boys.

i. Time to take 81 boys = 270 days.

ii. ,, ,, 1 ,, = 270 × 81 days.

iii. ,, ,, 90 ,, $= \frac{270 \times 81}{90}$

$= \underline{243 \text{ days.}}$ Ans.

Second Year.—Girls.

(1) G.C.M. of 27781 and 23507 =

23507	27781
21370	23507
2137	4374
	4274

G.C.M. = 2137.

To Prove that it is the *Greatest* Common Measure.

$27781 = 2137 \times 13$

$23507 = 2137 \times 11$

Now as 13 and 11 have no other common factor, 2137 must be the G.C.M.

Third Year.—Boys.

(2) Total distance = 1078 yards.
Distance travelled by both in one hour = 24½ miles.
Time to do 24½ miles = 60 minutes.

$$1 \text{ ,, } = \frac{60}{24\frac{1}{2}} \text{ ,,}$$

$$\frac{1078}{1760} = \frac{60}{24\frac{1}{2}} \times \frac{1078}{1760} = 1\tfrac{1}{2} \text{ minutes.}$$

A does 12 miles in 70 minutes,

$\therefore$ in 1½ minutes he does $\frac{12}{40} \times \frac{1760}{1}$ yds. = 528 yds.

B does 12½ miles in 60 minutes,

$\therefore$ in 1½ minutes he does $\frac{12\frac{1}{2}}{40} \times \frac{1760}{1}$ yds. = 550 yds.

Boys.

(4) Cost price = £40.
Selling price = £40 + 30 per cent. = £40 + $\frac{3}{10}$ = £52.
£20 sold at a gain of 10 per cent. = 20 + $\frac{1}{10}$ = £22.
Therefore the remaining half must realise 52 − 22 = £30.

C.—*Music.*

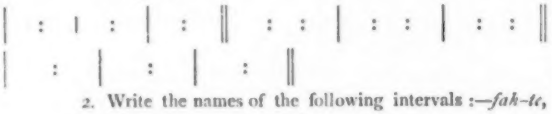
First Year.—Two-, three-, and four-pulse measures, etc.

Selected Government questions :—

1884.—1. Write a six-pulse tone, using two-pulse measure.
2. Name the following intervals :—*me–soh*, *soh–doh*¹, *soh–lah*, *doh–soh*.
3. Write the following an octave higher :—

m₁ d₁ m₁ s₁ l₁ t₁ d

1885.—1. What measures are shown by the following pulse signs :—



2. Write the names of the following intervals :—*fah–te*, *fah–ray*¹, *me–te*, *ray–fah*.
3. Write the following an octave higher, doubling the value of each note :—

| d :m | s : — ‖

4. Between which tones of the scale is there an interval of a major second.
5. Write the pulse signs for three-pulse and four-pulse measures.
6. Write (using two-pulse measures) one note continued through four pulses, and two notes each through two pulses.

1886.—1. Name the intervals :—*soh–te*, *me–lah*, *fah–doh*¹, *ray–te*.
2. Write the following an octave higher, halving each note :—

| s : — | m : — | d : — | — : | t₁ : — | d : — ‖

3. Name the intervals formed by the following :—
me–lah, *me–te*, *doh–lah*, *doh–fah*.
4. What notes in the scale are taught in the third step of the Tonic Sol-fa method.

1887.—1. What is the name of the interval between *te₁–fah*, *ray–me*, *lah–soh*.
2. Write in three-pulse measure one note four-pulses, another three-pulses, and another two-pulses in value.
3. Write the following an octave higher, doubling the value of each note :—

| m :s₁ | r : — | d : — ‖

1888.—1. Write the names of the following intervals :—*soh–doh*¹, *me–doh*¹, *te–lah*¹, *me–me*¹.
2. Write the following an octave lower, halving the valve of each note :—

| s : — | d¹ : — | t : — | — : — | m¹ : — | d¹ :— ‖

2. Write a three-pulse measure and four-pulse measure.
4. Name the following intervals :—*soh–ray*¹, *te₁–soh*, *te–ray*¹, *fah–me*¹.

1889.—1. What other four contiguous notes of the scale are separated by the same steps as d r m f

1890.—1. Where do Major Thirds and Minor Thirds occur in the scale ?
2. Name and write in order the three chief chords of the major scale.
3. Re-arrange the following in order of pitch, beginning with the lowest :—

f₁ s₁ f t₁ s d¹ m r¹ d m¹ t l₁

Second Year.—Finish any part not thoroughly known, and test knowledge by means of appended questions.

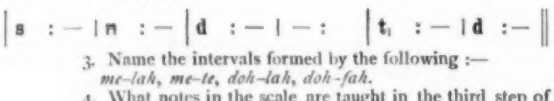
Selected Government questions :—

1885.—1. What is the mental effect of *fah*, *te*, *ray*.
2. Write the signs for four-pulse and nine-pulse measures.
3. Name the intervals *me–te*, *fah–te*, *te₁–fah*.

1886.—1. What is the mental effect of *soh*, *fah*, and *te*.
2. Name the following intervals :—*me–doh*¹, *re–te*, *te₁–soh*.
3. Which tone has a grave effect and which has a keen effect.
4. Name the intervals :—*fah*¹*–doh*¹, *fah₁–te₁*, *lah–fah*.

1887.—1. Name mental effect of *me*, *fah*, *doh*.
2. Name the intervals :—*ray–doh*¹, *fah–ray*, *ray–lah*.
3. Write a four-, three-, and nine-pulse measure.
4. Which tones are leaning ? Which have the greatest leaning tendency ?
5. Name the intervals :—*soh–re*¹, *te₁–lah*, *fah–lah*.

1888.—1. Name these measures :—

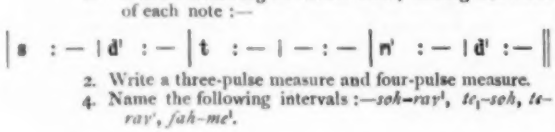


2. Write an augmented second above each :—*soh*, *doh*, *fah*.
3. In the minor mode which is the tonic, dominant, and minor seventh.
4. Rewrite the following, halving the value of each note and rest :—

| d :— .r | m :s .f | m : | :d ‖

1889.—1. Which are the expectant tones of the scale ?
2. What is the mental effect of *lah*, *fah*, *doh* ?
3. Name these intervals :—*fah–me*¹, *fah–te*, *doh–te*, *me–soh*.

1890.—1. Between which tones of the scale are these intervals found :—(*a*) augmented fourth (tritone), (*b*) major seventh.
2. What primary or secondary measures are here shown :—



Third Year.—Complete the revision of any part not thoroughly known.

Selected Government Questions :—

1885.—1. Write perfect fifths above *fah*, *me*, *lah*.
2. Explain Fortissimo, Rallentando, Allegro.

1886.—1. Give the value of each note in pulses :—

| d :—.m | s : — | s.,l :s.m ‖

2. Explain Largo, Vivace, Rallentando, Tempo Primo.
3. Write major sevenths above each :—*te*, *me*, *soh*.
4. Rewrite the following, halving the value of each note and rest :—

| s : — | : | m :—.m | m : | s .s :s .s | s :s ‖

5. Explain Mezzo Piano, Grazioso, Allegretto, Forte.

1887.—1. Give value in pulses of each note :—

| m :—.s : .s | f : — : — | .m :s.,f :m | m :—.,r :d ‖

2. In which key will this—m s d t₁ r d—be lowest, D, B♭, or A.
3. Explain M. 100, Accelerando, Crescendo, Vivace.

4. Taking the first note as *doh*, re-write the following :—

s f m r f m s d

5. Explain Rallentando, Grazioso, Allegretto, Mezzo Forte.

1888.—1. Write major sixths above *fah*, *lah*, *te*.

2. State the value in pulses of each note and rest :—

| s : .l | s.d' : t | d., s : f | m : | d : — ||

3. Explain briefly Legato, Dal Segno, Allegro, Retard.

4. Explain Ad Lib, Tempo Primo, Vivace, Forte.

D.—*Spelling.*

Learn 50 words each week from 'Words commonly Mis-spelt,' or any good list. Test frequently by dictation.

E.—*Geography.*

England and Wales. Chief points :—

1. Extent and Position.—Centre of land hemisphere, good harbours, and direct connection with all the important parts of the earth.

2. Coast Line.—This must be prepared in detail, and the character of formation should be noted.

3. Rivers, Mountains, and Lakes.—Maps of the important rivers' basins should be prepared (Thames R., Trent, Severn, Ouse).

4. Natural Productions.

5. Industries and Manufactures.—These are *very* important, and must be thoroughly known. The various industries should be taken, and the places engaged in them tabulated and entered in a sketch map.

6. Canals and Railways.

7. Towns.

8. Government, Education, Religion, etc.

N.B.—There is a great deal to do in this work, and much judgment must be used in the division of time.

Selected questions on above :—

1. Name and describe the leading industries of England, and assign reasons why each should be placed in its particular seat. (1885.)

2. What towns or districts in the United Kingdom are noted for the manufacture of lace, carpets, locomotives, glass, leather, earthenware, and linen; the smelting of iron, the quarrying of slate, and lead and copper mining? (1885.)

3. Draw a map of the west coast of England. (1886.)

4. The Black Country, the Fens, the New Forest, the Lake District. Describe briefly the situation and character of each. (1886.)

5. Give an account of the physical features, including industries and places of interest to travellers in *one* of the following counties :—Devon, Warwick, Carnarvon, Durham. (1887.)

6. Draw a map of the six northern counties of England, marking the seaports and positions of Manchester, Leeds, Sheffield, Bradford, Oldham, Blackburn, and Durham. (1887.)

7. Draw a map of the East Coast of England, marking the boundaries of the counties which adjoin the sea on that side, their ports and chief towns. (1888.)

8. Name the principal industries which have arisen upon the Northumberland, South Lancashire, and Warwickshire coal-fields, and point out the natural causes of the growth of those industries. (1888.)

9. In what parts of England are leather, iron, and woollen goods severally manufactured? Name three towns engaged in each of these industries. (1889.)

10. Give some account of the chief places passed in coasting from the Nore to Plymouth. (1890.)

11. What parts of the British Isles produce the best horses, mutton, butter, cheese, apples, wheat, oats, and flax?

12. Draw a map including the basins of the Severn and Wye, or of the Mersey, Ribble, Lune, and Eden. (1891.)

13. Give in tabular form the manufactures of Derby, Newcastle-on-Tyne, Bradford, Sheffield, Blackburn, Dublin, Stoke-on-Trent, and Norwich. (1891.)

14. Contrast the eastern and western shores of England.

15. Describe the Lake District of England, stating accurately the position of the Lakes.

F.—*History.*

Revise the History from 1066 to 1189.

Chief points :—

William I.—The conquest of England, the perfection of the Feudal System. (*Note* the terms connected with it.)

William II.—Misrule, commencement of conquest of Wales and Scotland.

Henry I.—Investiture dispute.

Stephen.—Claim to the throne, Civil War and results.

Henry II.—Becket, Constitutions of Clarendon, Legislative Reforms, Conquest of Ireland, Family differences, Foreign Possessions.

Brief lives should be learnt of Hereward, Anselm, Lanfranc, Becket, Strongbow, Robert of Gloucester.

Selected Government questions on the period :—

1. How did William the Conqueror deal with the estates of the English?

2. What were the chief results of the Norman Conquest?

3. Give a short account of Lanfranc or Anselm.

4. Who was the consort of Henry II.? Narrate the chief circumstances of her history.

5. What were the relations of England and Scotland in the time of Stephen? To which did Northumberland belong?

6. Name the son and daughter of Henry I., and say what you can of them.

7. Who was Henry II.? Mention his foreign possessions, and tell how he obtained each of them.

8. Explain the object of the Crusades, and discuss their social effects in England.

9. Tell what you know about the Domesday Book, Curfew, and the New Forest.

10. Give the date and the provisions of the Constitutions of Clarendon.

11. What was the Pale in Ireland? Explain fully.

12. Would you say that the condition of the people was better under William Rufus or Edward the Confessor, and in what respects?

13. Explain the terms Chivalry and Tournament, and describe a Feudal Castle.

14. How and when was Ireland attached to the English monarchy? Give particulars.

15. What do you know of Scutage? When was it introduced, and why?

16. When and where was the battle of the Standard fought? Why was it so called?

G.—*Euclid.*

Continue practise in writing out propositions, and work *at least* four deductions per week. Be careful to draw large and distinct figures, and do not use the letters A to G.

H.—*Algebra.*

(See note at head of Course. All P.T.'s are strongly advised to procure Thompson's 'Scholarship Algebra.')

1. Read very carefully Chaps. X., XI., XII., XIII., and XIV. Thompson's 'Scholarship Algebra.'

2. Work the following Test Paper :—

(1) Divide $a^4b^4 + a^2b^2c^2d^2 + c^4d^4$ by $a^2b^2 + abcd + c^2d^2$.
Ans. $a^2b^2 - abcd + c^2d^2$.

(2) Simplify $(x-a)^2 - (a-b)(a+b-3x) - (x-b)^2$.
Ans. $x(a-b)$.

(3) Find the factors of
(i) $35 - 74x + 35x^2$;
(ii) $x^2 + 4x + 4 - 4a^2 + 4ay - y^2$.
Ans. $(7-5x)(5-7x)$; $(x+2+2a-y)(x+2-2a+y)$.

(4) Solve $4{\cdot}8x - \frac{{\cdot}72x - {\cdot}05}{{\cdot}5} = 1{\cdot}6x + 8{\cdot}9$. Ans. 5.

(5) Find the fifth power of
$-\frac{3x^3}{5a^2}$ and the fourth root of $\frac{2401a^{16}x}{4096a^3x^9}$.
Ans. $-\frac{243x^{15}}{3125a^{10}}$; $\frac{7a^3}{8x^2}$.

(6) Find the H.C.F. of the expressions
$4x^4 - 33x^3 + 76x^2 - 39x$ and
$6x^5 - 46x^4 + 93x^3 - 27x^2$.
Ans. $x(x-3)$.

(7) Simplify $\frac{3x^2 - x - 10}{a^2 - ab - 2b^2} \times \frac{a^2 - 2ab}{3x^2 + 5x}$.
Ans. $\frac{a(x-2)}{x(a+b)}$.

I.—*Teaching.*

Second Year.—Flux's 'School Management,' Chapter II.

Third Year.—Read up carefully the Departmental Circular on Object Lessons. Varied Occupations and Physical Drill should also receive attention.

TEST QUESTIONS.—ALL YEARS.

Penmanship.—Write as specimen of Large-hand :—Neophyte, Olfactory, Psychology, Questionable.

Small-hand :—
Lars Porsena of Clusium, by the nine gods he swore
That the great house of Tarquin should suffer wrong no more.

Composition.—First years should practise the reproduction of a passage of average difficulty after reading once.

Second and Third Years.—Write an essay each week, selecting from the following subjects :—

Pictures.
Music.
Modern Life compared with Anglo-Saxon Life.
The Beauties of Nature.
'Still waters run deep.'
'Every cloud has a silver lining.'

Geography.—1. Draw a map of the west coast of Ireland.

2. Give examples of towns which have been noted for their rapid growth, and account for this where you can.

3. Give some account of the productions and industries of West Australia.

4. Where and what are the following :—The Fens, The Moors, The Downs, Bathurst Plains, Spinifex Desert, Basin of Minas, The Pine Barrens, Perth, and the Saguenay ?

History.—1. In what respects was the Feudal System modified in England after its introduction ?

2. Describe the character of one of the Norman Kings.

3. What was the Investiture dispute, how was it settled ? Explain the importance of the point at issue.

4. Assign events to the following dates :—1071, 1075, 1086, 1120, 1138, 1170, 1164, 1171, 1173.

First Year.

English.—1. Analyse the following passages from Gray's 'Bard':—121–124, 125–130, and 135–140.

2. Parse the following words :—Sublime (112), form (115), port (117), sweet (118), what (119), tyrant (130), voice (131), Enough for me (139), be (141), mine (142).

3. Explain the force of the suffixes in starling, kingdom, bishopric, firkin, paddle, childhood, wedlock, maiden.

4. Explain the following :—The bristled boor—the sable warrior—She-wolf of France—the meek usurper—Long lost Arthur.

Arithmetic.—Boys.—1. Find the value of $\frac{1}{10}$ × £1 5s. 4d. + $\frac{1}{21}$ of £1 3s. 2½d. + $\frac{1}{25}$ of 14s. 10½d. Ans. £2.

2. A boy lost $\frac{1}{4}$ of his marbles, in a second game he lost $\frac{7}{10}$ of the remainder, and in the third game he won $\frac{1}{9}$ of his second remainder and had the four marbles. How many had he at first ?
Ans. 32.

3. Multiply 28·75 by 32·8, and divide the result by 8·495.
Ans. 111.

4. If a vulgar fraction in its lowest terms can be represented by a terminating decimal, the factors of its denominator must be powers of 2 or 5. Prove this, and apply the test to ascertain whether $\frac{5}{8}$, $\frac{84}{125}$, $\frac{71}{48}$, $\frac{17}{56}$, $\frac{72}{88}$ satisfy the conditions.

Girls.—1. If 105 persons save on an average 19s. 10½d. each in a year, what will their whole savings amount to in 17 years 219 days ? Ans. £1,836 9s.

2. Make out the following bill :—27 bushels of plums, at 10½d. a gallon ; 960 peaches, at 5 a shilling ; 1⅜ cwt. of apples, at 2½d. per lb. ; 5 casks of cider, each 36 gallons, at 1½d. per pint.
Ans. £28 16s. 4d.

3. What must be added to $1\frac{9}{7} - 3\frac{1}{7} + 1\frac{4}{7}$ to make $\frac{11}{12} - \frac{33}{44} + \frac{14}{21}$?
Ans. $\frac{61}{252}$.

4. Show by means of a diagram that the value of a fraction is not altered by multiplying the numerator and the denominator by the same quantity.

Reduce $\frac{61101}{71670}$ to its lowest terms. Ans. $\frac{9}{11}$.

Music.—Answer the questions above.

Second Year.

English.—1. Paraphrase and analyse lines 255–266, 325–334, 413–422, 'The Traveller.'

2. Parse lines 397–400.

3. Give the substance of Goldsmith's remarks on Italy and its people.

4. Explain the following :—'The lap of May—the murmuring Loire—an amphibious world—Arcadian pride—famed Hydaspes—Wild Oswego—Luke's iron crown—Damien's bed of steel—the agonising wheel.

Arithmetic.—Boys.—1. Find the simple interest on £220 for seven months at 3¾ per cent., and deduct from it ·375 of a guinea.
Ans. £4 8s. 4½d.

2. Find the rate per cent. at which £411 10s. will amount to £416 12s. 10½d. in a quarter of a year. Ans. 5 per cent.

3. If I give a thirtieth part of my income to a charity, what sum will be due from me to the charity six months after my investing £1,958 6s. 8d. in the 3¾ per cents. at par ? Ans. £1 4s. 5⅞d.

4. Find the present value of £605 10s. 6d. due three years hence, the rate of interest being £4 15s. per cent. per annum.
Ans. £530.

Girls.—1. Reduce $7\frac{3}{4} - 4\frac{5}{12} - \frac{3}{21} + 1\frac{3}{12}$ to its lowest terms.
Ans. $4\frac{13}{28}$.

2. Express $\frac{3}{4}$ of $\frac{8}{17}$ of £1 14s. + $\frac{5}{8}$ of ⅓ of £1 10s. + 8½ of $\frac{3}{17}$ of 5s. as the fraction of £20. Ans. $\frac{119}{2720}$.

3. The factors of a certain number are $\frac{7}{12}$, $2\frac{5}{8}$, $1\frac{1}{4}$, and $5\frac{1}{2}$; what is $3\frac{5}{6}$ of $\frac{8}{21}$ of $\frac{3}{8}$ of the number ? Ans. $5\frac{3}{112}$.

4. I sold a house to A for ⅛ more than it cost me. A sold it to B for £18 13s. 4d., which was ⅓ less than it cost him. What did it cost me ? Ans. £19 4s.

Euclid.—1. Any two sides of a triangle are together greater than the third side.

2. The sum of the diagonals of any quadrilateral are together greater than half the sum of the sides.

Music.—Answer questions above.

Teaching.—1. Make some mental exercises on money suited for the First and Second Standards, and let them be as varied in form as possible.

2. What is the use of tracing in the earlier copy-book exercises, and what are the objections, if any, to the practice ?

3. Name eight words in the spelling of which young children often make mistakes, and explain by what sort of exercises such mistakes may be corrected or avoided.

Third Year.

English.—1. Paraphrase and analyse lines 259–266, 281–294.

2. Parse lines 247—250.

3. Take two of the following authors, and say where they lived and what they wrote :—Milton, Pope, Cowper, Hume, Coleridge, and Macaulay.

4. Write notes on the following :—The hound sagacious—natures ethereal—Young Ammon—aromatic pain—the mole's dim curtain—rapt seraph—Whatever is, is right.

Arithmetic.—Boys.—1. Simplify

$$\frac{2\frac{1}{2}}{5\frac{1}{2} + \frac{\frac{3}{4}}{3 + \frac{2}{5 - 3\frac{1}{4}}}};$$

and reduce ·0625 of £990 to the decimal of £100.
Ans. $\frac{288}{2800}$; 619.

2. In what ratio must two kinds of tea, costing respectively 1s. 3d. and 2s. 2d. a lb., be mixed so that the mixture may cost 1s. 6d. a lb.?
Ans. 8 : 3.

3. In a 200 yards race A can give B 10 yards start and win, and can give C 20 yards start. How much start could A give C?
Ans. 29 yards.

4. Show that the value of a fraction is not altered by multiplying numerator and denominator by the same number.
Divide 238·93 by 75, and add 11·896 to 1·4185, without reducing the decimals to vulgar fractions.
Ans. 3·1885 ; 13·3154.

Girls.—1. A bicycle wheel is 3·625 yards in circumference, and travels at the rate of 10·875 miles an hour. How often does it revolve in a minute?
Ans. 88 times.

2. A can do a piece of work in 8, B in 10, and C in 12 days. They all three start on the work together. A works 2 and C 3 days. In how many days after C has left will A finish? Ans. 1⅞ days.

3. A room is 21 feet 6 inches long and 15 feet 9 inches broad; find the cost of carpeting with carpet 27 inches wide at 3s. 9d. a yard.
£9 8s. 1½d.

4. Explain how you would give a first lesson on Proportion.

Euclid.—1. Prove I. 46 and I. 48.

2. Given the triangle PQR; find a point in QR from which lines drawn parallel to PQ, PR, and meeting them, are equal.

Music.—Answer questions above.

Teaching.—1. Write out complete notes of a lesson on one of the following subjects :—

(*a*) The House of Commons.
(*b*) The Primary Colours (for Infants).
(*c*) The Uses of the Electric Telegraph.
(*d*) Mountains.

2. Suppose you were criticising an object lesson given by another teacher, under what heads would you arrange your criticisms, and what tests would you apply in order to judge whether the lesson was successful or not?

Notes on 'The Bard.'

Lines 111 & on - Refer to the Court of Elizabeth.
,, 117 - *Port* = Carriage, Demeanour.
,, 119 - *Strings symphonious, vocal transport.* A poetic way of describing the poetry which was so strikingly produced in Elizabeth's reign.
,, 125, etc. - The stage is occupied by tragedies or comedies dealing with War or Love, Moral Truths or Fiction.
,, 135 - *Fond, impious man* = Edward I. Fond—meaning foolish.
Yon sanguine cloud, i.e., the slaughter of the Bards.
These lines may be rendered—'Foolish man! do you think that by murdering our poets you have checked the flow of patriotic song? Certainly you have not, any more than the passing of a cloud over the sun has quenched its light. The cloud soon passes away.'

The 'Traveller.'

Lines 335–348 - The independence of the English is not an unmixed blessing. It leads to the despising of others, to disputes, quarrels, and frenzied ambition, which disorganise the whole country.
,, 349–360 - Not only this, but as the feelings of love, honour, and duty to others disappear, they are replaced by the intense passion of avarice, until there is a danger that all the nobler qualities of a man may be forgotten, and a time may come when men are judged only by their wealth.
,, 361–376 - The danger lies in a misconception of 'Freedom.' *Licence* is not Liberty. Men are freer not where each can do as he likes, but where the duties and burdens necessary in a state are properly adjusted and distributed.
,, 377–392 - It is not freedom when only a faction is free. In England we may see nobles endeavouring to limit the power of the throne, and extend their own; harsh laws passed and enforced against the poor, while the rich escape scot free; men who have pillaged the poor abroad to make a fortune, and come home to make slaves here: all these make one prefer the absolute power of the throne to the domination of petty tyrants.
(*N.B.*—'Pillaged from slaves to purchase slaves at home' no doubt refers to the East Indian merchants and residents, whose ambition generally was to amass a fortune by any means abroad, and on their return purchase the rotten boroughs which had the right of sending members to Parliament.)
Lines 393–412 - These lines refer to the emigration from Ireland. They express feelings which do Goldsmith great credit, but they are not entirely just, or correct political economy.
,, 413–422 - The state and wishes of the emigrant.
,, 423–438 - The general conclusion of the poem. Perfect happiness exists nowhere under any form of government, because happiness depends not so much on external circumstances as on the internal mental condition. The greater part of the ills which come upon man are those beyond the power of any king or code of laws to alleviate.

'Essay on Man'—General Paraphrase.

Lines 113–172 - It is an impertinence for man to attempt to judge of the wisdom of the Creator's actions, and to say because man's unhappy therefore God's unjust; or that man should engross all the attension of the Deity. The reason of this arrogance in man is illimitable pride. Being granted to know a little, he is not content to exert his knowledge on what he can understand, but endeavours to fathom what is entirely beyond him. The angels aspiring to be equal to God, and man, aspiring to know as much as angels, lays himself open to the same punishment (131–140). An instance of this pride is the statement so frequently heard, that the earth and all its beauties were created specially for man. 'For *me*,' he says, 'the flowers were scattered over the surface of the earth; for *me* were created the vine, the rose, the dew; for *me* were all the treasures of earth produced. The springs were created specially for *my* benefit; the seas for *me* to sail over, the sun to give *me* light, the heaven for *my* canopy, and the earth for *my* footstool!' What presumption! 'But,' you enquire, 'if the earth is specially created for man and his pleasure, how do you account for the plagues, droughts, earthquakes, storms, and so on?'
(145–156.) 'Oh,' the answer is, 'God works by general laws, but there are a few exceptions; you cannot expect everything to be perfect.' If, then, Nature is not always perfect, why should we expect man to be? If earthquakes are a part of God's great purpose, why not such human monsters as Borgia and Cataline?
(157–164.) For all we know, the same God, who causes all such destruction on earth, may, with some purpose, inspire a Cæsar to be ambitious, or impel Alexander to be the scourge of mankind. The fact is, our pride impels us to account for everything, when the only thing for us to do is to submit to what is sent.
(165–172.) It might appear to our limited judgments that it would be better if nature were all harmony, and human beings all virtue; but we must remember that everything lives only by destroying something else. Passions are necessary to life, and what is true with regard to the natural world is true also of man.
,, 173–188 - Man, discontented, wants everything he sees. He is dissatisfied now because he does not know as much as the angels, and now because he has not the strength of a bull, not being able to see how wonderfully the particular powers, etc., of the various animals fit them for their peculiar method of life. We can hardly call man a rational being if he is content with nothing, if he has not everything.

Lines 189–206 - Man would find the greatest happiness, if he would only believe it, in using the faculties with which he is endowed to the full, and not in longing for greater powers, which would be unsuitable to his nature and state.

Take, for example, the sense of sight. Man is not endowed with an eye which can see extremely small objects. If he had such sight he might rival the fly, but he would be unable to behold the infinite wonders of the universe. If his sense of touch were made more delicate, life would be unbearable, for the slightest touch would cause an agony of pain. If the smell were more acute the odour of a rose might be so powerful as to cause death. If the hearing were increased in power, the brain would be stunned and bewildered by a continual roar, and he would soon wish that he had only hearing enough to listen to the whispering wind and the trickling music of the waterfall. These considerations alone are sufficient to show the infinite wisdom and providence of God.

,, 207–232 - It is both interesting and instructive to notice how the various sensual and mental abilities increase through the wide range of created beings, and attains its fullest development in man. From the smallest insect to the largest animal there is a perfectly just gradation. Consider sight: what a wide range there is from the nearly blind mole to the keen-sighted lynx; what difference between the headlong lioness and the bloodhound in the sense of smell; what a contrast in hearing between the fish of the streams and the musical songsters of the grove. Note how the sense of touch is developed in the spider, so that the lines of its web become nearly parts of its body. How remarkable is the instinct of the bee; and what a wide difference between the stupidity of the pig and the elephant, which in some cases appears nearly to possess reason. But although there is such a gradual ascent, each is distinctly separated from the other; there is a limit which is impassable, and this is necessary in order that no other being shall be equal to man, and that man should obtain and retain the supremacy over all other creatures. The supreme gift by which man becomes predominant is limited to him alone, and is the highest of all forms of thought—reason.

SCHOLARSHIP COURSE FOR DECEMBER, 1895.

WORK FOR THE MONTH.

Practise Reading-out and Copy-setting daily.

1. *Spelling.*—250 words from 'Words commonly Misspelt,' or any other good list.

2. *Composition.*—Write one or two essays each week, selecting the subjects from the following:—

Music and its place in Education.
The Decoration of Houses.
The Misery of being Old and Ignorant.
The River Thames.
The Evils of Procrastination.
The Power of Habit.
An English Village.
'More haste, less speed.'

(An essay should be sent in occasionally for examination and criticism; too much care can hardly be bestowed on this subject.)

Draft an analysis of each before writing and enter in note book.

Example: The Power of Habit.

(1) Meaning of the term Habit.

(2) Only acquired by continual practice, more easily in youth than in adult age.

(3) Once acquired—most difficult to break; instance by examples.

(4) The importance of watching most carefully the habits we are acquiring.

Read up the subject, if necessary, but write entirely from memory.

The Essay should occupy from 30 to 40 foolscap lines.

3. *English.*—(1) Analyse the following extracts and parse the words in italics:—

(*a*) Swiftly walk over the western wave,
Spirit of night!
Out of the misty eastern cave,
Where, *all* the long and lone *daylight*,
Thou wovest dreams of joy and fear,
Which make thee *terrible* and dear,
Swift *be* thy flight!
Wrap thy form in a mantle green,
Star *unwrought!*
Blind with thine hair the eyes of *Day;*
Kiss her, until she be wearied out,
Then wander o'er city, and sea, and land,
Touching all with thine opiate wand.
Come, *long sought!*

(*b*) In the lives of most men—*especially men* of high intellectual distinction—there comes, consciously or unconsciously, a time when they stand *as it were* at the parting of two roads, and are called upon to make choice for themselves in regard to some question of supreme moment. And it not *seldom* happens that *as* is their choice at this crisis of their career, so, for the most part, is the aim and drift of their after life.

(2) Learn 50 roots, with meanings and examples, per week.

(3) *Literature.*—Enter in a note book brief lives of the following writers, with their chief works, and brief descriptive notes:—Burns, Cowper, Southey, Wordsworth, Scott, Coleridge, Lamb, Campbell, Rogers, Moore, Byron, Hood, Shelley, and Keats.

(4) Revise the grammar and syntax of the Adjective and Pronoun.

4. *Arithmetic.—Men.*

(1) (*a*) Explain the statement that short division is a contracted form of long division.

(*b*) Define Least Common Multiple and Greatest Common Measure.

(*c*) In what sense can $\cdot\dot{7}$ be said to be equal to $\frac{7}{9}$.

(*d*) Give an example of inverse proportion and explain the term inverse.

(*e*) How would you explain the fact that in division of decimals the quotient may be larger than the dividend? give an example.

(2) A, B, and C have together £25. B has twice as much as A, and the difference between A's and C's shares is 16s. 4d. Find shares of each.

Ans. A = £6 9s. 1d.; B = £12 18s. 2d.; C = £5 12s. 9d.

(3) I change 50 lbs. of tea at 2s. 8d. per lb. for 170 lbs. of coffee. What must be the price of the coffee per lb. that I may gain 6¼ per cent? Ans. 10d.

(4) Two cubical tanks contain together 6,133,248 cubic feet, and the edge of one is twice as long as the edge of the other; find the edge of each. Ans. 88 feet; 176 feet.

(5) A true discount of £99 0s. 11d. is allowed on a bill for £1,899 17s. 7d. due two years hence; at what rate per cent., simple interest, is the discount calculated?

Ans. 2½ per cent.

(6) If I transfer £1,700 from the 3 per cents. at 98 to a 4 per cent. stock at 119 (neglecting brokerage), find gain in income? Ans. £5.

Girls.—

(1) Explain the meaning of these terms:—Multiple, common measure, ratio, proportion, compound interest, discount, and give an example of each.

(2) Value of a gold cup weighing 9 oz. 8 dwt. 19 grs., when gold is worth £3 17s. 10½d. per oz. Ans. £36 15s. $1\frac{93}{320}$d.

(3) If I gain 20 per cent. by selling tea at 6s. 8d., how much is gained by selling it at 7s. 6d? Ans. 35 per cent.

(4) If in 4 years £537 16s. 8d. amounts to £591 12s. 4d., what is the rate of interest? Ans. 2½ per cent.

(5) Convert $\frac{5}{41}$, $\frac{4}{13}$, $\frac{5}{22}$, into recurring decimals, and find by inspection the vulgar fractions equivalent to $\cdot\dot{5}$, $\cdot 02\dot{7}$, $\cdot\dot{5}3\dot{4}$, $\cdot 4263\dot{}$?

Ans. $\cdot\overline{12195}$, $\cdot\overline{307692}$; $\cdot\overline{150943962264}$; $\frac{5}{9}$, $\frac{3}{37}$, $\frac{178}{333}$, $\frac{1421}{3333}$.

(6) A corn factor bought 160 quarters of wheat at 41s. 3d. per quarter, and sold it at 58s. 4d. What did he gain, and at what price would he sell to gain £33?

Ans. £136 13s. 4d.; £2 5s. 4½d.

5. *Algebra.*—(See note at head of Course. All students are strongly advised to procure Thompson's 'Algebra' at once.)

Girls.—Read Chapters X. and XI., and work Exercises X. and XI., Thompson's 'Algebra.' Send any difficulties for solution.

Boys.—Read Chapters XXVI. and XXVII., and work Exercises XXVI. and XXVII., Thompson's 'Algebra'

6. *Euclid.*—Book II., Propositions X.–XIV.—Practise writing-out and work as many deductions as possible.

7. *Geography.*—Remaining American possessions.

(*a*) *Bermudas.*—Total area 20 square miles. Chief town: Hamilton. Fertile: Orange, cedar, olive, potatoes, arrowroot. Naval and military station.

(*b*) *Falkland Islands.*—Total area 6,500 square miles. Chief town: Stanley. Chief occupation: Sheep farming and cattle raising. Exports: Wool, meat, hides, skins, and tallow.

(*c*) *British Guiana.*—Area 109,000 square miles. Towns: George Town, Demerara, Essequibo, and Berbice. Fertile: Sugar, coffee, tobacco, indigo, ginger, quassia, ipecacuanha. Exports: Sugar, rum, molasses, timber, gold, indigo, coffee, and dye woods.

(*d*) *Honduras.*—Area 7,562 square miles. Chief town: Belise. Exports: Sugar, mahogany, logwood, coffee, india-rubber, sarsaperilla, and cocoa nut.

(*e*) *Jamaica.*—Area 4,250 square miles. Chief towns: Kingston and Spanish Town. Exports: Sugar, rum, molasses, coffee, spices, cotton, tobacco, ginger, arrowroot, cocoa, mahogany, etc.

(This colony needs special attention.)

(*f*) *West Indies.*—Bahamas, Virgin Islands, Anguilla, Barbuda, Antigua, St. Kitts, Nevis, Montserrat, Dominica, and Trinidad.

(Each of these must be noted, especially *towns* and *productions.*)

8. *History.*—Edward VI. and Mary I. Chief points:—

Edward VI.—Protectorate of Somerset. Act of Uniformity. Ket's Rebellion.
Protectorate of Northumberland. Act of Uniformity; Articles.

Mary I.—Lady Jane Grey and her short reign.
The restoration of Roman Catholicism.
The Marian Persecution.
The Spanish Alliance.
War with France.

Learn the following notes.

The Reformation.—(cont.)

7. *Statute of Six Articles.*

Acting under the advice of Gardiner, Bishop of Winchester, the King enacted this statute ('The Bloody Statute'), and enforced its observance by terrible penalties. All were adjudged heretics, and were liable to death by burning, or else to fine and imprisonment, who did not adhere to:—

(1) Transubstantiation.
(2) Communion of one kind.
(3) Celibacy of the clergy.
(4) Vows of chastity.
(5) Private masses for the dead.
(6) Auricular confession.

Cranmer sent his wife to Germany, and Latimer resigned his see. The use of the Bible was restrained, anyone other than a lord or a gentleman reading it being liable to a month's imprisonment. The Articles remained the established rule of faith until the end of Henry's reign. They were confirmed in 1540 by the publication of 'The Necessary Doctrine and Erudition of a Christian Man,' which in 1543 was again issued under the title of 'The King's Primer.' This terminated the progress which Henry made toward reformation. He had sanctioned a return to the use of the English language in the public services of the Church, authorised the publication, and at one time the true reading, of the Scriptures, and he had in some few points of doctrine approached the Reformation.

On the other hand, he retained a capricious partiality for the Romish practices in those very points where pious Catholics desired an alteration, *e.g.*, the denial of the cup, and celibacy of the clergy; and the doctrine of transubstantiation, which was the great superstition in the eyes of the Reformers, he always insisted upon under the penalty of death by fire.

The Reformation in England was, however, gradually gaining ground, as shown by—

(*a*) The circulation of the Reformers' books and of the Holy Scriptures.

(*b*) The popular belief that vice and corruption prevailed in the Church.

(*c*) The continued persecution which had to be resorted to.

8. *Reformation under Edward VI.*

Somerset was a zealous Reformer, and had very little opposition from the Council after he had removed the Chancellor Wriothesly.

Persecution under the 'Bloody Statute' ceased, prisoners were released and exiles recalled. The First Book of Homilies was drawn up and a general visitation of the Churches made. Gardiner resisted and was sent to the Tower. Bonner submitted; Tunstal, Bishop of Durham, was excluded from the Council.

When Parliament assembled it was enacted that Communion should be received in both kinds (*i.e.* bread and wine). The Statutes against Lollards was repealed. In the next session the Book of Common Prayer was ordered to be used.

9. *School Management.*—Chapter XII. Scholarship School Management. The new circular on Object Lessons should be carefully read.

10. *Domestic Economy.*—Infectious Diseases—their cause, etc. Disinfectants and Deodorisers. General laws of Health with regard to Personal Cleanliness, Drainage, Proper Food, etc.

11. *Music.*—Musical Terms in common use.

12. *French.*—10 pages of 'Le Trésor.' (For translation see *Girls' Mistress*, weekly.) Prepare the regular conjugation, interrogative, affirmative, and negative. Be careful to learn all the irregular verbs met with.

TEST QUESTIONS.

1. Give some account of the first English novelists.

2. Explain the meaning and the Grammar of the word *but* in each of the following sentences:—

(*a*) 'There is no man *but* honours you.'

(*b*) '*But* yesterday the word of Cæsar might
Have stood against the world.'

(*c*) He came *but* did not remain long.

(*d*) 'Life has passed
With me *but* roughly since I saw thee last.'

(*e*) 'No tongue *but* Hubert's.'

3. Give examples from any poem you have read or learnt, of (1) Simile, (2) Metaphor, (3) Personification.

4. (*Girls.*)—Work Exercises VI., Thompson's 'Algebra.'

(*Boys.*)—(*a*) Solve the equations—

$$\cdot 8x - \cdot 067 = \cdot 473 + \cdot 071x\ ;$$
$$33x + 55y = 4\ ;\ 55x - 55y = -16.$$

Ans. $\frac{39}{47}$; $x = -\frac{1}{11}$, $y = \frac{1}{5}$.

(*b*) Extract the square root of

$$16x^2(x-2) - 8x(1-3x) + 1.$$

Ans. $4x^2 - 4x + 1$.

(*c*) Find the L.C.M. of

$$32a^5b^2 - 32a^4b^3 + 8a^3b^4;\ 48a^5b^5 - 48a^4b^6 + 12a^3b^7.$$

Ans. $24a^3b^5(2a-b)^2$.

(*d*) Divide

$$2 - \frac{3n}{m} + \frac{9n^2 - 2m^2}{m^2 - 2mn} \text{ by } \frac{1}{m} - \frac{1}{m - 2n - \frac{4n^2}{m+n}}.$$

Ans. $\frac{3n-m}{2}$.

(*e*)
$$a(x+y) + b(x-y) = 2a$$
$$y(a+b) - x(a-b) = 2b$$

Ans. $x = 1$; $y = 1$.

(*f*) A dealer adds 20 per cent. to the cost price of an article to make the selling price; afterwards, in selling, he deducts 10 per cent. from the selling price, and then obtains a profit of 6s. Find the cost price? Ans. 75 shillings.

5. Draw a map of France.

6. What is meant by the term Dominion of Canada? How is it governed?

7. What led to the Reformation in England? What part did Cranmer play in it?

8. (*Boys.*)—(*a*) Prove II. 5.

(*b*) Give the algebraical equivalent to the enunciations of II. 4, 5, 6, and 7.

9. (*Girls.*)—How would you act if a child in your class (1) broke her arm, (2) was stung by a wasp, (3) cut her arm, or (4) set her dress on fire?

10. (*a*) Re-write the following—(1) doubling the value of every note and rest, and (2) again, halving the value of every note and rest.

| m.f :s | :.d | f :-.s | m : — ‖

(*b*) Name the following intervals—

$\begin{matrix}\{t \\ (m\end{matrix}$ $\begin{matrix}\{f^1 \\ (se\end{matrix}$ $\begin{matrix}\{t \\ (r\end{matrix}$ $\begin{matrix}\{d^1 \\ (se\end{matrix}$

(*c*) If the first note of each of the following passages is regarded as t_1, what will the others become?

(i.) fe s r l t d^1 fe l fe m d t_1

(ii.) m f s ta l d^1 ta s ta l m f

(*d*) Write a descending minor scale (*lah* mode) using the minor or occasional seventh, and the minor or essential sixth.

(*e*) Explain the terms, (1) Largo, (2) Andante, (3) Dal Segno, (4) Sforzando.

CORRESPONDENCE.

1. Individual assistance will be given as far as possible by advice, solution of difficulties in any subjects, model answers, etc.

2. Specimens of Writing, Paraphrasing, Maps, Composition, etc., will be marked and criticised gratis.

3. To assist students in rural districts, Freehand or Model Drawings will be corrected and marked, with hints for improvement, etc., and returned if accompanied by a postage stamp.

4. As a rule, all replies will appear in the Correspondence Column, but anyone desiring an immediate reply may obtain it by enclosing a stamped, addressed envelope.

5. To ensure an answer in the next issue queries must be sent by the 15th of each month.

6. Name and address of sender, with coupon of current number of the PRACTICAL TEACHER, and *nom de plume* if desired, must be enclosed.

All communications and queries with regard to these courses to be addressed to Arthur T. Flux, 12, Lower Park Road, Belvedere, Kent.

ANSWERS TO CORRESPONDENTS.

WORRIED.—You will find full explanation and typical sums in Chapter XX., 'Scholarship Algebra.'

SUFF DOUBTFUL.—You are not the only one. See note under English in Pupil Teachers' Course.

PER SALTUM.—Chignecto is the name of the isthmus connecting Nova Scotia and New Brunswick. There is a famous ship-railway across it.

ANSWERED BY LETTER.—H.W. (Hastings); E.H. (Staines); E.G. (Diss); J.C. (Sheffield); S.H.P. (Wigan); H.B. (Stoke); E.M.A. (Llanelly); P.S. (Wigan); E.A.P. (Rugeley); H.W.C. (Swaffham), 'Code Perplexed'; G.R.M. (Blackpool); F.P. (Sheldon).

NEW COMPOSITION STORIES.—STANDARD V.

Suitable for 'Unseen Tests' in Reading also.

355.

A WAGER WELL MADE.—A wager was made by two tradesmen, one of them a close-set little one, and the other a tall, huge man, in consequence of the latter boasting of his superior strength of body, by which the little one undertook to carry a considerable distance two sacks of wheat, each to contain four bushels. The little man accordingly procured one sack, and put four bushels of wheat into it, and then drawing the other sack over it, contended that both sacks contained four bushels, which he carried with ease. The stakeholder decided that both sacks did contain the quantity agreed on, and the money was handed over.

356.

THE PRECIOUS CAT.—A Frenchman, by his will, ordered a fine horse he had to be sold, and the price given to a religious house. It so happened that all the rest of his effects were barely sufficient to pay his debts, and his widow and children remained to be provided for. The monks appearing to claim the value of the horse, the widow desired her servant to take it to the market, at the same time directing him how to manage matters. This animal being of an uncommonly good appearance, it was not long before his price was asked. The servant answered, 'Just a franc.' The intending purchaser was astonished at such a low price, and thought the seller was in jest. 'Nay,' said the latter, 'I have brought a little cat which you must buy also, otherwise you cannot get the horse, and its price is no less than 1,000 francs.' The money was accordingly paid without scruple, and the priests thus outwitted.

357.

THE PET MONKEY AND THE BANTAM HEN.—One day a monkey watched the cook while she was preparing some partridges for dinner, and I suppose that in his own mind he considered all birds ought to be so treated, so he managed to get into the yard where his mistress kept a few pet bantam fowls, and after robbing them of their eggs, he secured one of the poor hens, with which he proceeded to the kitchen, and then commenced plucking it. The noise that the poor bird made brought some of the servants to the rescue, but they found it in such a pitiful and bleeding state, that in mercy it was at once killed.

358.

A MISER'S TRAP.—A gentleman called on a rich but miserly old nobleman, and found him endeavouring to catch a fly. Presently he succeeded in entrapping one, which he immediately put into the sugar bowl, and shut down the cover. The gentleman asked for an explanation of this singular sport. 'I'll tell you,' replied the miser, a triumphant grin overspreading his countenance as he spoke, 'I want to ascertain if the servants steal the sugar.'

359.

PROFIT AND LOSS.—Some few days ago, a young lady, accompanied by her brother, whilst riding in an omnibus from the city to the West-end, was struck by the appearance of one of her fellow passengers, who, besides being dressed in the height of fashion, wore a magnificent diamond ring—a circumstance which not unnaturally attracted the attention of the lady. On arriving at their journey's end, the sister was very anxious to know from her brother whether he had noticed the gentleman with the magnificent ring. The circumstance, however, had escaped the brother's observation. In the course of the afternoon, the lady, having occasion for her purse, which contained in the morning some £15, discovered, alas! that it was gone, but in lieu thereof the identical diamond ring, worth 60 guineas, was left in its stead. There is no doubt that the ring was the result of some previous robbery, and being too large for the thief's finger, it slipped off while abstracting the purse from the lady's pocket.

360.

ALWAYS ASKED 'WHY?'—Once there was a boy who was never satisfied with the information given him. He always came down on the informer with a 'Why?' If his father or mother told him to do anything, his invariable reply was the same. He was going along a street where a number of men were hoisting a safe to the floor of a building. He walked on the pavement beneath the hanging mass of metal. A man called out to him in a loud voice: 'Get out of the way, quick!' He stopped short, and said, inquiringly: 'Why?' At that moment the safe fell on him. No one answered his question. It wouldn't have been any use.

361.

A CUNNING CAT.—One day the cook in a monastery, when he laid the dinner, found one brother's portion of meat missing. He supposed that he had miscalculated, made good the deficiency, and thought of it no more till the next day, when he had again too little at dinner time by one monk's commons. He suspected knavery, and resolved to watch for the thief. On the third day he was quite sure that he had his meat cut into the right number of portions, and was about to dish up, when he was called off by a ring at the outer gate. When he came back there was again a monk's allowance gone. Next day he again paid special heed to his calculations; and when he was on the point of dishing up, again there was a ring at the gate, to draw him from the kitchen. He went no further than the outside of the kitchen door, when he saw that the cat jumped in at the window, and went out again in an instant with a piece of meat. Another day's watching showed that it was the cat also who, by leaping up at it, set the bell ringing with her paws; and thus having, as she supposed, drawn the cook out of the kitchen, made the coast clear for her own proceedings. The monks then settled it that the cat should be left thus to earn for the remainder of her days double rations, while they spread abroad the story of her cunning. So they obtained many visitors, who paid money for good places from which to see the little comedy; and they grew the richer for the thief they had among them.

362.

A NOVEL MANNER OF SELECTION.—In the East, great officials are often selected in ways which strike us as peculiar. A certain Sultan decided upon the general who should take charge of an expedition in the following way:—He had an apple placed upon the middle of a large carpet, and then called the various candidates for the position one by one into the room. To each one he said, 'I will give the command to the man who can get the apple without placing a foot upon the carpet, or using any stick or instrument to reach it.' One after the other they lay down at full length upon the carpet, with their toes just outside the edge, and endeavoured to reach the apple. Not even the tallest was able, however, to touch it, and one by one they were requested to stand on one side whilst another entered and made a trial. Last of all came in a very stout man, and those who had failed smiled at the very idea of his trying to reach the apple. He, however, after a moment's pause, proceeded to roll up the carpet until he could pick up the apple and hand it to the Sultan. The smile on the faces of the bystanders changed to a look of wonder, and the Sultan said, in giving him the appointment, 'You are the man to be a successful leader, because you will be able to overcome difficulties.'

363.

A JAW BREAKING JOKE.—In the reign of Charles II. it was customary when a gentleman drank a lady's health to throw some article of dress into the flames in her honour, and all his companions were obliged to sacrifice a similar article, whatever it might be. One of Sir Charles Sedley's friends, perceiving that he wore a rich lace cravat, drank to the health of a certain lady, and threw his cravat into the fire. Sir Charles followed the example very good-naturedly, but said he would have his joke in return. Afterwards, when he dined with the same party, he filled a bumper to some reigning beauty, and called on a dentist to extract a decayed tooth that had long pained him. Etiquette demanded that every one of the party should have a tooth extracted and thrown into the fire, to which they all yielded, after many murmurs about the cruelty of the thing.

364.

HE KNEW THEIR WAYS.—An old gentleman long contrived to have his garden weeded gratis by beggars. As he had a handsome house near the road, it naturally drew the attention of the tramps. On their application for charity, he invariably asked them the usual question: 'Why don't you work?' to which the reply was always made: 'So I would, God bless your worship, if I could get employment.' On this, musing awhile, as if inclined by charity, he would set them to weed his court or garden, furnishing them with a hoe and wheelbarrow, and promising them a shilling when their job was completed. To work, then, they would go, with much seeming gratitude. The gentleman stayed by them, or visited them from time to time till they had performed two-thirds of their task. He then retired to a private corner to watch them, in order to prevent their stealing his tools, and there waited for what constantly happened the moment he disappeared, which was the elopement of his workmen, who, rather than complete the unfinished third of his work, chose to give up what he had done. This method the old man long practised, till at length he was troubled with no more applications for charity.

365.

A GRATEFUL FOX.—A blacksmith, very early one morning, was going through a plantation to a gentleman's house to shoe some horses, and in the roadway he saw a fox sitting, with one fore-paw held up, his ears laid back, and his brush draggled. The animal remained motionless, and looked up beseechingly to the blacksmith, who, stooping down, looked at the foot, and found a swelling and gathering; he took a horse-nail from his box and pricked the part. It gave the fox immediate relief, and, nodding his head, he trotted off into the wood. Would you believe it, the next morning when the smith went to open his door, he found a couple of fine dead fat fowls laid there? The blacksmith took them inside, and the following morning there was a couple of good fat ducks, and one day there was a fine young goose. Well, during the following winter there was a farmer out with the hounds, and when the fox broke covert the hounds followed, and it was to this man's hen-roost that the fox went each night, till he had cleared most of the poultry away, and in this manner the fox paid his enemy out.

366.

THE DIFFERENCE BETWEEN GO AND COME.—A gentleman in Surrey had land which was worth two hundred pounds per annum, and which he himself cultivated; but as his income arising from it was not equal to his expenditure, he was necessitated to sell one half of it to pay his debts, and let the rest to a farmer for a term of twenty-one years. Before that term was expired, the farmer, one day, bringing his rent, asked him if he would sell the land. 'Why,' said he, 'would you buy it?' 'If it please you,' said the farmer. 'How?' said he; 'that is strange. Tell me how this comes to pass, that I could not live upon twice as much land, being my own; and you, upon one half of it, though you have paid the rent, are able to buy it?' 'O,' said the farmer, 'two words only make all the difference. You said, "GO"; and I say, "COME."' 'What is the meaning of that?' said the gentleman. 'You lay in bed,' said the farmer, 'or took your pleasure, and sent others about your business: I rise early, and see my business done myself. You said to the men, "Go, and do the work"; I say, "COME, and do it"; so that I have my eye upon them, and even afford them assistance.'

367.

A ROYAL PROGENY.—A celebrated preacher, addressing himself to Richard I., King of England, told him he had three daughters to marry, and that if he did not dispose of them soon God would punish him severely. 'You are a false prophet,' said the King; 'I have no daughter.' 'Pardon me, Sir,' replied the priest; 'your Majesty has three, Ambition, Avarice, and Luxury; get rid of them as fast as possible, else assuredly some great misfortune will be the consequence.' 'If it must be so, then,' said the King, with a sneer, 'I give my Ambition to the Templars, my Avarice to the Monks, and my Luxury to the Prelates.'

368.

SERVED HIM RIGHT.—A miser, having lost one hundred pounds, promised ten pounds reward to anyone who should bring it to him. A poor man found and restored it to the miser, and demanded the reward; but the old man, in order to baffle him, alleged there were a hundred and ten pounds in the bag when he lost it. The poor man, however, was advised to sue for the money; and, when the cause came on to be tried, it appeared that the seal had not been broken, nor the bag ripped, and the judge said to the defendant's counsel: 'The bag you lost had a hundred and ten pounds in it, you say?' 'Yes, sir.' 'Then,' said the judge, 'according to the evidence given in court, this cannot be your money, for here are only one hundred pounds; therefore the plaintiff must keep it till the true owner appears. Verdict accordingly, with all the expenses of suit to the opposite party. This decision almost broke the heart of the miser, who would gladly have compromised the matter for half the amount.

369.

TRAPPING A TIGER.—An ingenious mode of tiger-killing is that which is employed by the natives of Oude. They gather a number of the broad leaves of a certain tree, and having well besmeared them with a kind of birdlime, they strew them in the animal's way, taking care to lay them with the prepared side uppermost. Let a tiger but put his paw on one of these innocent-looking leaves and his fate is settled. Finding the leaf stick to his paw, he shakes it, in order to rid himself of the nuisance, and finding that plan unsuccessful, he endeavours to attain his object by rubbing it against his face, thereby smearing the birdlime over his nose and eyes, and glueing the eye-lids together. By this time he has probably trodden upon several more of these treacherous leaves, and is bewildered with the novel inconvenience, then he rolls on the ground, and rubs his head and face on the earth in his efforts to get free. By so doing, he only adds fresh birdlime to his head, body, and limbs, and finishes by covering himself so thoroughly with leaves and birdlime, that he lies floundering on the ground,

tearing up the earth with his claws, uttering howls of rage and dismay, and exhausted by the struggles in which he has been so long engaged. These cries are a signal to the authors of his misery, who run to the spot, armed with guns and clubs, and soon put him to death.

370.

A SKILFUL FEE-FINDER.—Sir Richard Jebb was attending a nobleman from whom he had a right to expect five guineas; he received only three. Suspecting some trick on the part of the steward, from whom he received it, he at the next visit contrived to drop the three guineas. They were picked up, and again deposited in his hand; but he still continued to look on the carpet. His lordship asked if all the guineas were found. 'There must be two still on the carpet,' replied Sir Richard, 'for I have but three.' The hint was taken as he meant.

371.

ARTFUL.—A Londoner, on a visit to the seaside, hired a horse to take out himself and some friends. The day for the outing arrived, but the friends did not turn up. Our Londoner now had no use for the horse, but he did not wish to lose the five shillings which he had paid in advance. Accordingly, he proceeded to the stables, and asked the proprietor to show him the horse he was to have. This was done, and the man, to the astonishment of the owner, proceeded to feel the horse all over. He then looked into his mouth, examined his feet, and finally produced a tape-measure, and started to measure the horse from the tip of his nose to his tail. 'Well,' said the proprietor, 'will he do for you?' 'Oh, yes, he will do for me; but I don't think he will carry my friends. You see, there are four of us, and when we are all on him, there won't be much room to spare; and we are going a long way.' The owner handed over the deposit money quickly, and advised the man to go and hire a horse to carry four from someone else.

372.

UNANIMOUS.—A village in Japan was harassed by a midnight robber, whom nobody could detect. One of the leading inhabitants summoned the entire male population under his charge, and directed every man to write the name of the person whom he suspected and to deposit the ticket in a box. Fifteen ballots bore the name of the same man, the rest being blanks. The man whom everybody distrusted was so overcome with astonishment that he made a full confession and went to prison. Never before, in the history of popular government, was a thief elected with such unanimity.

373.

TO THE POINT.—A certain distinguished man, on leaving an hotel at which he had stayed, was asked by the landlord to write something in the visitor's book with his autograph beneath. He thought a moment, and then wrote: 'I came to this hotel for a change and rest. The waiters got the change, and the landlord got the rest.'

374.

PRACTICAL.—A good story is told of a gentleman who presented some fine grapes from his vinery to the Queen when, on a journey through Scotland, she stopped at a station for lunch. In a day or two a letter came from her Majesty thanking the donor for the grapes, and complimenting him on the fineness of the fruit. The gentleman read the letter to his head gardener, who would, he thought, be interested in the compliment, but the only comment the gardener made was—'She doesn't say anything about sending back the basket.'

375.

'PAY BEFORE YOU EAT.'—The proprietor of a café in Paris was very much annoyed by poor customers, who took advantage of the temporary absence of the waiters to step out without paying their bills. Finally, he put up a notice all round the café, inside, 'Pay before you eat.' The principal dish was a very thin but palatable soup, served in large deep bowls. One day a man came in, and sitting down before a large bowl of soup which had been just poured out, he began to help himself. A waiter came up and said: 'Pay before you eat.' 'I always eat first.' 'Not here. Our rule is, as you see, pay first.' 'I don't pay first,' said the man; and he continued to help himself to the soup, when to his great astonishment the waiter pulled out of his pocket an immense wooden syringe, and dipping the nozzle of it into the soup bowl, drew the soup all out of the bowl into the syringe. 'Will you pay now?' asked the grinning waiter, holding the syringe suspended over the edge of the empty bowl. The man decided to obey the rules, as the waiter had him at his mercy. Reluctantly he laid the money on the table, and back the soup went.

376.

ENCOURAGING.—Some years ago a party of Cambridge professors undertook, for a scientific object, to penetrate into the depths of a Cornish mine. One of the number used to relate with infinite gusto the following startling incident of his visit. On his ascent in the ordinary manner, by means of a bucket, and with a miner for a fellow passenger, he perceived, as he thought, certain unmistakable symptoms of frailty in the rope. 'How often do you change your ropes, my good man?' he inquired, when about half-way from the bottom of the awful abyss. 'We change them every three months, sir,' replied the man in the bucket; 'and we shall change this one to-morrow, if we get up safe!'

NEW READING TESTS.—STANDARD III.

Suitable for 'Unseen Tests' in Dictation also.

251.—Most spiders have eight very fine eyes, though some have only six; two of these are in the back of their heads, two in the front, and the rest at the sides. Like other insects they cannot move them, and they have no eyelids.—(H.M.I.'s Test.)

252.—Monkeys and many other creatures consider spiders as most delicious tit-bits, and the fine webs they make to catch flies with will not protect them from their own enemies. From each other they also require protection, for they are very quarrelsome and fond of fighting.—(H.M.I.'s Test.)

253.—To get the honey from the bell of the foxglove, the bee has to enter deep into the bell; when she leaves it, the brushes on her legs are full of pollen, and then when she flies off to another foxglove and creeps into this, the pollen on her legs is brushed off and forms seeds that produce new varieties.—(H.M.I.'s Test.)

254.—A poor French prisoner had a pet spider, who used to come out of its hole to be fed regularly, and the man taught it to make its appearance when a few notes were played upon a musical instrument. So whenever he wanted the spider he had only to play a tune, and out of the hole his little friend would instantly peep.—(H.M.I.'s Test.)

255.—Some spiders build themselves beautiful nests, which in texture resemble the finest muslin. Many of these creatures are two inches long, with legs that extend to seven inches in length, and they are covered all over the body and legs with coarse grey and red hairs. They weave thick, white webs, and entangle little birds in them.—(H.M.I.'s Test.)

256.—A lady-bird is a beetle, and a very useful one, as well as a very pretty one. It devours all the insects that it can get hold of that are most injurious to vegetation. It attaches itself to a leaf, just like a caterpillar, but, when the time of transformation arrives, out comes a little round, crimson, hard lady-bird.—(H.M.I.'s Test.)

257.—Some beetles are very clever, and take an immense deal of trouble for the future little beetles. They make up balls of dirt, in which they intend to lay their eggs, and roll these balls along with the greatest care, in order to take them to a safe place and then to lay their eggs in them.—(H.M.I.'s Test.)

258.—Dragon-flies are so called because they are just as fierce and ferocious, and as dangerous to the inhabitants of the air, as any dragon could possibly be supposed to be to

the dwellers on earth. They kill everything that comes in their way—even moths and butterflies cannot escape.—(H.M.I.'s Test.)

259.—Some ants have beautiful silver wings, and fly here and there and enjoy themselves while they are quite young; but, when they grow older and ought to stay at home to attend to their duties, they actually deprive themselves of their wings, so that they are not able to gad about. If they don't do this the workers do it for them.—(H.M.I.'s Test.)

260.—Ants are most wonderful creatures. They build great cities underground, with long galleries, and roads or streets among them. They roof their houses with beams of wood, which they cross in a clever and curious fashion, and they fill up the spaces between, chiefly with corn and other grains. —(H.M.I.'s Test.)

261.—In a warm spring, cockchafers make their appearance in April; they are most plentiful in May, and disappear altogether by the end of June. They are very destructive, and devour our best trees, eating up their leaves. They live in these trees during the day, seeking the most shady parts, for they hate the sunshine and only fly about at night.—(H.M.I.'s Test.)

262.—A mole is a common but very curious animal that burrows in our fields, and of whose character and habits naturalists wish they knew more than they can ever hope to do; for how can they become acquainted with the habits and character of a creature who lives and works in pitch darkness underground!—(H.M.I.'s Test.)

NEW DICTATION TESTS.—STANDARD IV.

Suitable for 'Unseen Tests' in Reading also.

No. 235.

WHATEVER is right, whatever is wrong, in this perplexing world, we must be right in 'doing justly, in loving mercy, in walking humbly with our God,' in denying our wills, in ruling our tongues, in softening and sweetening our tempers, in learning patience, meekness, purity, forgiveness of injuries, and continuance in well-doing.

No. 236.

THE preparation of the gum used on postage stamps was once the work of a solitary individual who declined to disclose the recipe of his secret, even to the Government which employed him. He always did his work alone, in a room carefully locked to prevent intrusion. An inquisitive official, however, fearful that the secret might be lost, in case of the man's sudden death, employed a sweep to creep down the chimney while the gum-maker was at work. The sweep discovered the mystery—the splendid gum was nothing more than fried starch.

No. 237.

IN different parts of the globe are found various sorts of trees that yield a thick oil or resin, that, like tallow, is used for making candles, and hence the trees are popularly styled tailow trees. The substance is commonly extracted by making a cut in the bark, from which the oily matter exudes. In other cases the seeds are boiled, from which a fine white tallow is obtained. The candles and soap so made are beautifully white.

No. 238.

THE chief secret of comfort lies in not suffering trifles to vex us and in cultivating our undergrowth of small pleasures. Try to regard present vexations as you will regard them a month hence. Since we cannot get what we like, let us like what we can get. It is not riches, it is not poverty, it is human nature that is the trouble. The world is like a looking-glass. Laugh at it and it laughs back; frown at it and it frowns back. Angry thoughts canker the mind and dispose it to the worst temper in the world—that of fixed malice and revenge. It is while in this temper that most men become criminals.

No. 239.

AN angry letter, especially if the writer be well-beloved, is so much fiercer than any angry speech. There the words remain, scorching, not to be-explained away, not to be atoned for by a kiss, not to be softened down by the word of love that may follow so quickly upon spoken anger. This at least should be a rule through the letter-writing world—that no angry letter be posted until four-and-twenty hours shall have elapsed since it was written.

No. 240.

IT is said that the three rings which Queen Victoria prizes the most highly are: First of all, her wedding ring; then a small enamel ring, with a tiny diamond in the centre, which the Prince Consort gave her at the age of sixteen, and an enamel serpent which he gave her as an engagement ring. For many years after the Prince Consort's death her Majesty slept with these rings on her fingers, only taking them off to wash her hands, as the water would, of course, spoil the enamel.

No. 241.

SELECT from the ordinary letter-sorting staff of the General Post Office there is a small class of the oldest and most experienced in the service who are designated 'Blind Sorters.' This is not, as might be hastily though somewhat reasonably inferred, on account of any optical defect, but solely because of their peculiar employment. It is the duty of these officers to deal with all letters which are either illegibly or wrongly directed, or whose destinations are unknown or obscure.

No. 242.

FOR getting rid of the cares of the day, for producing a pleasant sense of relaxation, for purifying the blood, for raising the spirits, for encouraging sound and refreshing sleep, there is nothing better than a walk after a moderate dinner. To those who have not practised the habit, the first few walks may prove fatiguing and disappointing; but let them give it a fair trial. Perseverance will amply justify what some may consider rather novel advice.

No. 243.

BEFORE the invention of gummed envelopes, letters were closed by means of wax, in which the sender usually impressed a seal bearing the arms or crest of his family or some fanciful device. The gummed envelope is so secure, so cleanly, and so readily closed, that it has driven sealing-wax almost entirely out of use; and, as a consequence, the seal, which was usually attached to the watch-guard, and formed a prominent part of one's personal embellishment, has all but disappeared.

No. 244.

A FRENCHMAN who had settled in a small Dutch town, and who could never learn the language of his adopted country, might have starved but for a servant he had who could speak the language of the natives. He said one day to a travelling countryman of his: 'My friend, you have no conception of the gross stupidity of the people about here. I have now lived about twenty years in this place, and still they don't know a word of French.'

No. 245.

IT is a good thing to believe; it is a good thing to admire. By continually looking upwards our minds will themselves grow upwards, and, as a man, by indulging in habits of scorn and contempt for others, is sure to descend to the level of what he despises; so the opposite habits of admiring and reverence for excellence impart to ourselves a portion of the qualities we admire. Here, as in everything else, humility is the surest path to exaltation.

No. 246.

CARE is something that rightly falls to the lot of all. Childhood alone may claim exemption from it. As the life advances, it comes with every new responsibility, and every honest man and woman accepts it cheerfully as his or her share in the world's burdens. It develops power, it encourages endeavour, it promotes happiness. No one but the selfish idler would wish to be entirely free from care; but we justly hold him in honour who faithfully takes up that which falls to his lot, and fulfils the duties it involves.

No. 247.

IN China there is a profession for ladies, strange, because openly and handsomely remunerated in the current coin of the realm. It is carried on by elderly ladies, who go from house to house of rich

tearing up the earth with his claws, uttering howls of rage and dismay, and exhausted by the struggles in which he has been so long engaged. These cries are a signal to the authors of his misery, who run to the spot, armed with guns and clubs, and soon put him to death.

370.

A SKILFUL FEE-FINDER.—Sir Richard Jebb was attending a nobleman from whom he had a right to expect five guineas; he received only three. Suspecting some trick on the part of the steward, from whom he received it, he at the next visit contrived to drop the three guineas. They were picked up, and again deposited in his hand; but he still continued to look on the carpet. His lordship asked if all the guineas were found. 'There must be two still on the carpet,' replied Sir Richard, 'for I have but three.' The hint was taken as he meant.

371.

ARTFUL.—A Londoner, on a visit to the seaside, hired a horse to take out himself and some friends. The day for the outing arrived, but the friends did not turn up. Our Londoner now had no use for the horse, but he did not wish to lose the five shillings which he had paid in advance. Accordingly, he proceeded to the stables, and asked the proprietor to show him the horse he was to have. This was done, and the man, to the astonishment of the owner, proceeded to feel the horse all over. He then looked into his mouth, examined his feet, and finally produced a tape-measure, and started to measure the horse from the tip of his nose to his tail. 'Well,' said the proprietor, 'will he do for you?' 'Oh, yes, he will do for me; but I don't think he will carry my friends. You see, there are four of us, and when we are all on him, there won't be much room to spare; and we are going a long way.' The owner handed over the deposit money quickly, and advised the man to go and hire a horse to carry four from someone else.

372.

UNANIMOUS.—A village in Japan was harassed by a midnight robber, whom nobody could detect. One of the leading inhabitants summoned the entire male population under his charge, and directed every man to write the name of the person whom he suspected and to deposit the ticket in a box. Fifteen ballots bore the name of the same man, the rest being blanks. The man whom everybody distrusted was so overcome with astonishment that he made a full confession and went to prison. Never before, in the history of popular government, was a thief elected with such unanimity.

373.

TO THE POINT.—A certain distinguished man, on leaving an hotel at which he had stayed, was asked by the landlord to write something in the visitor's book with his autograph beneath. He thought a moment, and then wrote: 'I came to this hotel for a change and rest. The waiters got the change, and the landlord got the rest.'

374.

PRACTICAL.—A good story is told of a gentleman who presented some fine grapes from his vinery to the Queen when, on a journey through Scotland, she stopped at a station for lunch. In a day or two a letter came from her Majesty thanking the donor for the grapes, and complimenting him on the fineness of the fruit. The gentleman read the letter to his head gardener, who would, he thought, be interested in the compliment, but the only comment the gardener made was—'She doesn't say anything about sending back the basket.'

375.

'PAY BEFORE YOU EAT.'—The proprietor of a café in Paris was very much annoyed by poor customers, who took advantage of the temporary absence of the waiters to step out without paying their bills. Finally, he put up a notice all round the café, inside, 'Pay before you eat.' The principal dish was a very thin but palatable soup, served in large deep bowls. One day a man came in, and sitting down before a large bowl of soup which had been just poured out, he began to help himself. A waiter came up and said: 'Pay before you eat.' 'I always eat first.' 'Not here. Our rule is, as you see, pay first.' 'I don't pay first,' said the man; and he continued to help himself to the soup, when to his great astonishment the waiter pulled out of his pocket an immense wooden syringe, and dipping the nozzle of it into the soup bowl, drew the soup all out of the bowl into the syringe. 'Will you pay now?' asked the grinning waiter, holding the syringe suspended over the edge of the empty bowl. The man decided to obey the rules, as the waiter had him at his mercy. Reluctantly he laid the money on the table, and back the soup went.

376.

ENCOURAGING.—Some years ago a party of Cambridge professors undertook, for a scientific object, to penetrate into the depths of a Cornish mine. One of the number used to relate with infinite gusto the following startling incident of his visit. On his ascent in the ordinary manner, by means of a bucket, and with a miner for a fellow passenger, he perceived, as he thought, certain unmistakable symptoms of frailty in the rope. 'How often do you change your ropes, my good man?' he inquired, when about half-way from the bottom of the awful abyss. 'We change them every three months, sir,' replied the man in the bucket; 'and we shall change this one to-morrow, if we get up safe!'

NEW READING TESTS.—STANDARD III.

Suitable for 'Unseen Tests' in Dictation also.

251.—Most spiders have eight very fine eyes, though some have only six; two of these are in the back of their heads, two in the front, and the rest at the sides. Like other insects they cannot move them, and they have no eyelids.—(H.M.I.'s Test.)

252.—Monkeys and many other creatures consider spiders as most delicious tit-bits, and the fine webs they make to catch flies with will not protect them from their own enemies. From each other they also require protection, for they are very quarrelsome and fond of fighting.—(H.M.I.'s Test.)

253.—To get the honey from the bell of the foxglove, the bee has to enter deep into the bell; when she leaves it, the brushes on her legs are full of pollen, and then when she flies off to another foxglove and creeps into this, the pollen on her legs is brushed off and forms seeds that produce new varieties.—(H.M.I.'s Test.)

254.—A poor French prisoner had a pet spider, who used to come out of its hole to be fed regularly, and the man taught it to make its appearance when a few notes were played upon a musical instrument. So whenever he wanted the spider he had only to play a tune, and out of the hole his little friend would instantly peep.—(H.M.I.'s Test.)

255.—Some spiders build themselves beautiful nests, which in texture resemble the finest muslin. Many of these creatures are two inches long, with legs that extend to seven inches in length, and they are covered all over the body and legs with coarse grey and red hairs. They weave thick, white webs, and entangle little birds in them.—(H.M.I.'s Test.)

256.—A lady-bird is a beetle, and a very useful one, as well as a very pretty one. It devours all the insects that it can get hold of that are most injurious to vegetation. It attaches itself to a leaf, just like a caterpillar, but, when the time of transformation arrives, out comes a little round, crimson, hard lady-bird.—(H.M.I.'s Test.)

257.—Some beetles are very clever, and take an immense deal of trouble for the future little beetles. They make up balls of dirt, in which they intend to lay their eggs, and roll these balls along with the greatest care, in order to take them to a safe place and then to lay their eggs in them.—(H.M.I.'s Test.)

258.—Dragon-flies are so called because they are just as fierce and ferocious, and as dangerous to the inhabitants of the air, as any dragon could possibly be supposed to be to

the dwellers on earth. They kill everything that comes in their way—even moths and butterflies cannot escape.—(H.M.I.'s Test.)

259.—Some ants have beautiful silver wings, and fly here and there and enjoy themselves while they are quite young; but, when they grow older and ought to stay at home to attend to their duties, they actually deprive themselves of their wings, so that they are not able to gad about. If they don't do this the workers do it for them.—(H.M.I.'s Test.)

260.—Ants are most wonderful creatures. They build great cities underground, with long galleries, and roads or streets among them. They roof their houses with beams of wood, which they cross in a clever and curious fashion, and they fill up the spaces between, chiefly with corn and other grains. —(H.M.I.'s Test.)

261.—In a warm spring, cockchafers make their appearance in April; they are most plentiful in May, and disappear altogether by the end of June. They are very destructive, and devour our best trees, eating up their leaves. They live in these trees during the day, seeking the most shady parts, for they hate the sunshine and only fly about at night.—(H.M.I.'s Test.)

262.—A mole is a common but very curious animal that burrows in our fields, and of whose character and habits naturalists wish they knew more than they can ever hope to do; for how can they become acquainted with the habits and character of a creature who lives and works in pitch darkness underground!—(H.M.I.'s Test.)

NEW DICTATION TESTS.—STANDARD IV.

Suitable for 'Unseen Tests' in Reading also.

No. 235.

WHATEVER is right, whatever is wrong, in this perplexing world, we must be right in 'doing justly, in loving mercy, in walking humbly with our God,' in denying our wills, in ruling our tongues, in softening and sweetening our tempers, in learning patience, meekness, purity, forgiveness of injuries, and continuance in well-doing.

No. 236.

THE preparation of the gum used on postage stamps was once the work of a solitary individual who declined to disclose the recipe of his secret, even to the Government which employed him. He always did his work alone, in a room carefully locked to prevent intrusion. An inquisitive official, however, fearful that the secret might be lost, in case of the man's sudden death, employed a sweep to creep down the chimney while the gum-maker was at work. The sweep discovered the mystery—the splendid gum was nothing more than fried starch.

No. 237.

IN different parts of the globe are found various sorts of trees that yield a thick oil or resin, that, like tallow, is used for making candles, and hence the trees are popularly styled tallow trees. The substance is commonly extracted by making a cut in the bark, from which the oily matter exudes. In other cases the seeds are boiled, from which a fine white tallow is obtained. The candles and soap so made are beautifully white.

No. 238.

THE chief secret of comfort lies in not suffering trifles to vex us and in cultivating our undergrowth of small pleasures. Try to regard present vexations as you will regard them a month hence. Since we cannot get what we like, let us like what we can get. It is not riches, it is not poverty, it is human nature that is the trouble. The world is like a looking-glass. Laugh at it and it laughs back; frown at it and it frowns back. Angry thoughts canker the mind and dispose it to the worst temper in the world—that of fixed malice and revenge. It is while in this temper that most men become criminals.

No. 239.

AN angry letter, especially if the writer be well-beloved, is so much fiercer than any angry speech. There the words remain, scorching, not to be explained away, not to be atoned for by a kiss, not to be softened down by the word of love that may follow so quickly upon spoken anger. This at least should be a rule through the letter-writing world—that no angry letter be posted until four-and-twenty hours shall have elapsed since it was written.

No. 240.

IT is said that the three rings which Queen Victoria prizes the most highly are: First of all, her wedding ring; then a small enamel ring, with a tiny diamond in the centre, which the Prince Consort gave her at the age of sixteen, and an enamel serpent which he gave her as an engagement ring. For many years after the Prince Consort's death her Majesty slept with these rings on her fingers, only taking them off to wash her hands, as the water would, of course, spoil the enamel.

No. 241.

SELECT from the ordinary letter-sorting staff of the General Post Office there is a small class of the oldest and most experienced in the service who are designated 'Blind Sorters.' This is not, as might be hastily though somewhat reasonably inferred, on account of any optical defect, but solely because of their peculiar employment. It is the duty of these officers to deal with all letters which are either illegibly or wrongly directed, or whose destinations are unknown or obscure.

No. 242.

FOR getting rid of the cares of the day, for producing a pleasant sense of relaxation, for purifying the blood, for raising the spirits, for encouraging sound and refreshing sleep, there is nothing better than a walk after a moderate dinner. To those who have not practised the habit, the first few walks may prove fatiguing and disappointing; but let them give it a fair trial. Perseverance will amply justify what some may consider rather novel advice.

No. 243.

BEFORE the invention of gummed envelopes, letters were closed by means of wax, in which the sender usually impressed a seal bearing the arms or crest of his family or some fanciful device. The gummed envelope is so secure, so cleanly, and so readily closed, that it has driven sealing-wax almost entirely out of use; and, as a consequence, the seal, which was usually attached to the watch-guard, and formed a prominent part of one's personal embellishment, has all but disappeared.

No. 244.

A FRENCHMAN who had settled in a small Dutch town, and who could never learn the language of his adopted country, might have starved but for a servant he had who could speak the language of the natives. He said one day to a travelling countryman of his: 'My friend, you have no conception of the gross stupidity of the people about here. I have now lived about twenty years in this place, and still they don't know a word of French.'

No. 245.

IT is a good thing to believe; it is a good thing to admire. By continually looking upwards our minds will themselves grow upwards, and, as a man, by indulging in habits of scorn and contempt for others, is sure to descend to the level of what he despises; so the opposite habits of admiring and reverence for excellence impart to ourselves a portion of the qualities we admire. Here, as in everything else, humility is the surest path to exaltation.

No. 246.

CARE is something that rightly falls to the lot of all. Childhood alone may claim exemption from it. As the life advances, it comes with every new responsibility, and every honest man and woman accepts it cheerfully as his or her share in the world's burdens. It develops power, it encourages endeavour, it promotes happiness. No one but the selfish idler would wish to be entirely free from care; but we justly hold him in honour who faithfully takes up that which falls to his lot, and fulfils the duties it involves.

No. 247.

IN China there is a profession for ladies, strange, because openly and handsomely remunerated in the current coin of the realm. It is carried on by elderly ladies, who go from house to house of rich

people announcing their coming by beating a drum and offering their services to amuse the lady of the house. This offer accepted, they sit down and tell her the latest scandal and the newest stories, and are rewarded at the rate of half-a-crown an hour, besides a handsome present should some portion of their gossip have proved particularly acceptable.

No. 248.

CATS, large and small, make the most careful toilet of any class of animals, excepting some of the oppossums. The lions and tigers wash themselves in exactly the same manner as the cat, wetting the dark, indiarubber-like ball of the forefoot and inner toe, and passing it over the face and behind the ears. The foot is thus at the same time a face sponge and brush, and the rough tongue combs the rest of the body. Hares also use their feet to wash their faces, and the hare's foot is so suitable for a brush that it is always used to apply the 'paint' to the faces for the stage.

No. 249.

BADGER-BAITING was a brutal sport at one time in vogue in this country as a kind of 'attraction' in public-houses of the lowest class. The animal was kept in a tub or barrel, and was attacked by dogs. Yielding at last to superior numbers, it was dragged or drawn out. The badger was then set free and permitted to return to its tub until it recovered from the effects of the struggle, after which it was again baited. It had to submit to this barbarous treatment several times a day.

No. 250.

AS if Chinamen and rabbits were not sufficient, Australia has got new foes to cope with—plagues of mice. They come in droves, eating everything they can put a tooth into. They devour the corn in the fields, they steal the provender from the horses, and in one place they ate the whole carcase of a freshly-killed sheep in one night, leaving only the bare bones. In another place they ate the bandages off the legs of the race-horses. The habits of these mice are peculiar; they certainly have very bad taste in their choice of a meal!

No. 251.

A QUEER looking fish was not long since obtained off the coast of Africa. It was brought up from a great depth, and presented a strange appearance. Its colour was deep black, and it was about a foot and a half long. But its most peculiar feature was its large and capacious mouth, which was furnished with an elastic skin not unlike that of the pelican. Very little is known of this striking member of the finny tribe, for it seems quite different from any other kind known. It is also said to have little power of locomotion—an odd weakness in a fish.

No. 252.

AN influential committee of London ladies having pronounced against the use of birds for purposes of personal decoration, it remains to be seen how far their mandate will command the approval of the sex. Women have erred hitherto, let us hope, rather through want of art than want of heart. Once the world is brought to see that a smashed bird, so far from being an adornment, is a monstrously ugly object, the battle will be won.

No. 253.

A NEW imperial train has just been built for the Emperor of Russia. Instead of the old armour-plates of steel, the saloons are covered with an eight inch thickness of cork, protected on the outside by a layer of iron. The saloons are outwardly of the same appearance, so that no one may be able to discover in which the Czar is travelling. During the Emperor's journey last autumn he passed most of his time in a carriage which, viewed from the outside, was like an ordinary luggage-van.

No. 254.

A REMARKABLE instance has occurred of a lark returning to its cage after having enjoyed a fortnight's liberty. One day the cage was blown to the ground by a gust of wind, and the door opening, the bird escaped. A fortnight after the lark returned to the house, and manifested great desire to return to its former abode. This it did, to the astonishment of its owner, when the cage door was opened.

No. 255.

IN addition to flint and steel, fire or light may be produced from various substances not prepared for the purpose. One of these is loaf sugar. If you strike together two large pieces of loaf sugar in a dark place, a pale blue flame like lightning will be produced. Some of the aborigines of Australia, as is well known, obtain fire from a kind of reed, by friction of one part against another.

No. 256.

NOT long since there died in a workhouse in Southwark a pedlar who used to sell odds-and-ends on a tray on London Bridge, and who pretended to be deaf and dumb. It is said that, though clothed in rags, he was a Swiss gentleman of means who, stung by remorse, had vowed not to open his lips for ten years, to go bare-headed and barefooted, and to abandon for twenty years all the advantages of his fortune. His vow was rigidly kept, and at the period of his death, he was in the fourteenth year of his singular penance.

No. 257.

BEES are being trained as letter-carriers by an English farmer. A bee is taken away from home, a letter is gummed to his little back, and he is thrown into the air. Home he goes, like a carrier pigeon; and the chief advantage he would enjoy over his big brother is that he could not be seen in time of war, or, if seen, could not very well be shot.

No. 258.

A PROMISING innovation in railway travelling is, it is said, shortly to be started, the idea, if report speaks truly, of an enterprising Englishman. This is a railway lending library, which will hire out books to travellers to beguile the tedium of their journey. On starting the passenger pays a deposit on each book borrowed with a small fee charged for the loan. If he likes his book he can, of course, keep it altogether, or he can return it and recover his deposit.

No. 259.

THE Sultan's latest gift to the Emperor of Germany consists of a complete suite of Oriental furniture in ten pieces, each of which is superbly inlaid with mother-of-pearl on which are engraved the arms and monogram of the Sultan. He has also sent the Empress two splendid vases of great value in blue enamel and silver. He had also sent a set of diamond studs to each of the young princes, and a fan-shaped brooch of diamonds, rubies and sapphires to the young princess.—(H. M. I.'s Test.)

No. 260.

A VESSEL was lying ice-bound in the harbour of a seaport town, and, as is usually the case with ships, she carried a crew of rats in addition to her sailors and cargo. I suppose there is nothing these animals dislike more than idleness, and so they set about gnawing a hole through the planks just above the ice. The hole was not noticed, and as soon as the increasing weight of snow caused the vessel to settle down, the water at length entered it, and the ship sank. Fortunately not much harm was done.

No. 261.

AT the felling of an ancient hollow oak in a German forest, when the tree crashed to the ground it disclosed a human skeleton in excellent preservation. From his long boots, powder-flask, and other articles found, he appeared to have been a hunter, and it was concluded that the unfortunate man, in climbing the tree in pursuit of some wounded bird or animal, had slipped into the hollow trunk, been unable to extricate himself, and so had perished miserably of starvation.

No. 262.

A CURIOUS fact in connection with the question as to the use of gold in the arts is, that the American Pullman Car Company has begun using gold in connection with the metal work in its newest cars. All the metal work which is used about the lamps, the seats, and the hat-racks is gold-mounted. The Pullman managers say that this is not extravagant, but sound business, because the gold will prove more serviceable than any metal used before for the purpose.

No. 263.

LIVE and let live, 'tis the law of our being,
The rich and the poor on each other depend—
All men are equal before the All-seeing.
Each in his turn stands in need of a friend.
Be to a foe in distress like a brother;
Oh! it is sweet to forget and forgive—
Love all that's lovely, be kind to each other:
Nature's best law is, to live and let live.

STANDARDS V.—VII., AND 1ST & 2ND YEAR P.T's.

No. 217.

WE think it may be laid down as a fundamental law of the art of winning men that there must be some point at which we come into actual touch with the life we desire to reach. One common experience, which is deep and real, will do more to influence the soul of a man than the lavishing upon him of the most costly gifts. We

cannot fully enter into all the feelings, sympathies, notions, and life of any other human being. He may have a hundred experiences we cannot understand, but if in one there is spiritual communication and fellowship, a link of the finest quality has been formed. Never were there such forces of low things to win men from, nor such visions of high things to attract them to, as there are in the days in which we live.

No. 218.

THE carriage in which the Queen takes her railway journeys is one of the handsomest Pullman cars which has ever been built. The walls of the saloon are of satin-wood, highly polished, and the cushions are of white silk and gold thread. The chair which the Queen occupies is very large, and faces the engine. Within easy reach of this chair is a silver plate, in which are knobs by which, upon pressing, she can summon her different attendants, who occupy another part of the carriage. Three other easy chairs occupy a space in her compartment, besides a magnificent table. The carpet is of velvet pile, and the curtains are hung on silver poles; the door handles are also of solid silver. The furniture, hangings, &c., were selected by the Queen herself.

No. 219.

THE Chinese do everything backward. Their compass points to the south instead of the north. The men wear skirts and the women trousers; while the men wear their hair long, the women coil theirs in a knot. The dressmakers are men: the women carry burdens. The spoken language is not written, and the written language is not spoken. Books are read backward, and any notes are inserted at the top. White is used for mourning; and the bridesmaids wear black—instead of being maidens, these functionaries are old women. The Chinese surname comes first, and they shake their own hands instead of the hands of one whom they would greet. Vessels are launched sideways, and horses are mounted from the off side. They commence their dinner with dessert, and end up with soup and fish.

No. 220.

BECAUSE our friendships are so interwoven with all that is closest and best in our lives, nothing hurts like the defection of a friend; disappointment cuts to the quick. By all the sweetness of the past, and by its thousand confidences, by the broken hopes and blighted expectations of the future, we measure the loss when a friend proves false. It is not that special friend alone of whom we grieve; a blow has been struck at all friendship, and our faith in our kind has been shaken. In this pass, if its sad experience ever come to us, we may gather some consolation from the thought that we are lamenting not so much a faithless friend as a lost ideal, for it is of the very essence of friendship that it shall be immortal.

No. 221.

ONE of the severest tests of courage is to carry on one's life quietly and faithfully under the cloud of a great uncertainty. Something which makes it uncertain in what direction one's activity is hereafter to be put forth. This is not an uncommon experience; but, although it happens to many, it is never on that account easier to bear. Living by faith has always involved a struggle even for the most heroic souls, and most of us learn it by the most painful processes. Nevertheless, if we are to live with any strength or peace, learn it we must, sooner or later. If one broods over an uncertainty, strength is paralysed and work half done.

No. 222.

A PLEASANT letter is the pleasantest thing that this world has to give. It should be good-humoured, witty it may be, but with a gentle diluted wit; concocted brilliancy will spoil it altogether. Not long, so that it be tedious in the reading; nor brief, so that the delight suffice not to make itself felt. It should be written especially for the reader, should apply altogether to him, and not to any other. It should never flatter. Flattery is odious. But underneath the visible stream of pungent water there may be the slightest current of eulogy, so that it be not seen, only understood. It should be legibly written, but not more. That it be fairly written, and not ungrammatical, the writer owes to his schoolmaster; but this should come of habit, not of care. Then let its page be sullied by no business; one touch of utility will destroy it all.

No. 223.

DIFFICULTIES should be looked in the face. When a favourite plan is before us we magnify the advantages, and throw the difficulties into the shade. Hence our means will not be wisely adapted to the end. Failure is often occasioned by difficulties which might have been foreseen and guarded against. We should look difficulties in the face; we should look at them directly, and with a desire to see them in their full force. Danger should be looked in the face. The uncertain and unknown magnifies our fears. A full and accurate view of the danger takes away the power of imagination. Looking danger in the face gives courage. It enables us to adopt wise means to guard against it.

No. 224.

WHEN life powers have, in some sort, arrived at maturity, and its simplest acts are infused with a deeper and sterner meaning than lies on the surface, men and women grow into a truer appreciation of the value and worth of friends and friendships. Those who have been by our side, alike in our joys and sorrows, are to us as precious gems to be treasured in the safest places of our love and care. We regard them with the reverent affection that the soldier feels for the decoration on his breast. A jewel to be guarded and delighted in, a sign of promotion, a gauge of merit, is a friend in whom one confides without the shadow of a doubt.

No. 225.

THE tigers of India are fond of monkey meat, and the monkeys are not fond of being eaten. They therefore match their brains agninst the tigers' cunning and strength in this way; the monkeys drive away tigers and leopards by assembling in all their strength upon the trees beneath which the tiger is lurking, shaking the branches with might and main and pattering down upon him such a heavy shower of dry sticks, twigs, and leaves that the latter is forced, with an angry growl, to quit his lair and seek quieter quarters. But no peace is allowed so long as he remains in their vicinity.

No. 226.

LIFE is not entirely made up of great evils or heavy trials, but the perpetual recurrence of petty evils and small trials in the ordinary and appointed exercise of the Christian graces. To bear with the failings of those about us—with their infirmities, their bad judgment, their ill-breeding, their perverse tempers; to endure neglect when we feel we deserved attention, and ingratitude when we expected thanks; to bear with the company of disagreeable people whom Providence has placed in our way, and whom He has perhaps provided or purposed for the trial of our virtue—these are the best exercises of patience and self-denial, and the better because not chosen by ourselves.

No. 227.

A ROMANTIC affair has just happened in the Turkish army. A short time ago the discovery was made quite accidentally that a young girl had been serving for three and a half years under her brother's name in a regiment there, and had distinguished herself by specially good conduct. When the Sultan was informed of the unheard of case, and learned that the young girl had taken this daring step in order to free her brother, who was the only support of his mother, from military service, he bestowed the Order of the Third Class on her, and has given her a life pension of five Turkish pounds a month. She was, of course, sent home at once, and her brother remained free from serving.

No. 228.

THE sea is the largest of all cemeteries, and its slumberers sleep without monuments. All other grave-yards, in all other lands, show some symbol of distinction between the great and small, the rich and poor; but in that ocean cemetery the king and the clown, the prince and the peasant, are alike distinguished. The same waves roll over all—the same requiem by the minstrelsy of the ocean is sung to their honour. Over their remains the same storm beats, and the same sun shines, and there unmarked, the weak and the powerful, the plumed and the unhonoured, will sleep on until awakened by the same trump when the sea shall give up its dead.

No. 229.

SIBERIA is one of the finest undeveloped countries in the world, and it is really difficult to exaggerate the enormous wealth of this gigantic region. The soil is of almost inexhaustible wealth, and the crops magnificent. There is almost no limit to the production of the land. The Russians themselves have but an imperfect idea of the immensity of their natural wealth, and other people outside Russia cannot realise it at all. Siberia, so far from being a region of desolation and of death, is a northern Australia, with larger rivers, more extensive forests, and mineral wealth not inferior to that of the inland continent. In a few years Siberia will be bridged from end to end with railways, and in this matter the Russian government is showing a large and wise policy. It is irrigated from end to end with some of the largest rivers in the world, navigable for thousands of miles through fertile and richly wooded lands, destined to be the home of millions of colonists.

No. 230.

PARROTS have long been taught to amuse by their imitation of the human voice, and now their powers in this respect have been

made use of for a practical purpose. At almost every station on a northern railway the station-master has a parrot or a starling so trained that, whenever a train draws up at the platform, it commences calling out the name of the station most distinctly, and not only this, but it continues doing so while the train remains there. This has been found an excellent mode of informing the passengers where they are. An importation of these novel railway porters is much needed at English stations.

No. 231.

PARIS is exhibiting a new utilisation of glass for household purposes, which takes the form of window and bed curtains. This invention is said to be possessed of many virtues. As a window curtain it is pretty and effective, and does not obscure the light; whilst as a bed curtain it ensures a certain immunity from the danger of a conflagration to such persons as indulge in the habit of reading in bed. The glass for these new hangings is manufactured in small coloured squares, each in zinc frames, having tiny hooks at the sides by which they are hung to one another.

No. 232.

TAKE life like a man. Take it just as though it were, as it is, an earnest, vital, essential affair. Take it just as though you personally were born to the task of performing a merry part in it, as though the world had waited for your coming. Take it as though it were a grand opportunity to do and to achieve, to carry forward great and good schemes, to help and cheer a suffering, weary, it may be heart-broken, brother. The fact is, life is undervalued by a great majority of mankind. It is not made half as much of as should be the case. Where is the man or woman who accomplishes one tithe of what might be done?

No. 233.

ONE of the saddest sights in the world is the cemetery at Johannesburg. A piece of land on the slope of a hill above the town has been enclosed, and this is the last resting-place of between twelve and fourteen hundred people, the larger proportion of whom are young fellows between nineteen and thirty, who rushed up here convinced that a few months would see them rich for life. Most of the graves are nameless; but all are numbered, and a register is kept corresponding to the numbers. There are rows upon rows of little children's graves, comparatively few women's, but all these latter quite young. At one end of the enclosure is the Jewish burial place —perhaps even better kept than the Christian.

No. 234.

WHEN the manufacture of bicycles and tricycles was pushed so prominently to the front, it seems surprising that some enterprising spirit did not perceive the golden chance of securing for Sheffield what was certain to become, and has become, a great business. As it is, it supplies the steel and the great bulk of the fittings and accessories for wheelmen, but the trade itself has gone to Coventry and prospered there. What Sheffield has lost can only be gauged by what the City of the Three Spires has gained. Thousands of hands are employed in the production of the various kinds of cycles in favour all over the world. The capital embarked is something enormous, and the profits accruing from the yearly sales are known to be, putting it in the mildest way, quite satisfactory.

No. 235.

NOTHING ought to be pleasanter or more exalting to our minds than social intercourse; and this can be made pleasanter by the due observance of good manners. When we come to look back upon our lives, we must own, every one of us, that we have liked those of our acquaintance the best who have drawn out the most of the good that is in us, who have kindled the strongest desire to increase our knowledge and to raise the standard of our thoughts. The foundation of every human soul is goodness.

No. 236.

A CORK factory is an odd place. Scarcely a sound comes from the building where the industry is carried on. Noiseless machinery whirls with great rapidity; the only sound heard is that of escaping steam. Cork is soft and elastic, as everybody knows, and is the bark of a species of oak, which grows abundantly in Portugal, Italy, and Spain; principally in Spain. The trees grow to a prodigious size, and live to the ripe old age of 150 years. At fifteen they begin to bear, and continue to furnish new crops of bark every five years. The harvesting occurs in the early spring. Incisions are made around the trees, and the bark is stripped off. It is then boiled to take out the sap, after which it passes through the pressing process. When dry, it is cut, scraped, trimmed, and put up in bales like cotton, for shipment.

No. 237.

IN Belgium the railway companies have just devised a useful plan for the benefit of country visitors and others in the large towns. In Brussels and elsewhere one can now buy goods in the principal shops, and have them forwarded direct to any of the railway stations, there to be delivered to the purchaser when starting on his homeward journey. Books containing a number of tickets are issued at a penny apiece to the tradesmen. When buying articles to be sent to a station, the purchaser has one of the tallies given to him, and on producing it the goods are handed over by the railway luggage clerk to whose care they had been entrusted.

No. 238.

IN early days the Dutch used to pride themselves upon the beauty and costliness of their linen and china, upon which many of the rich families were known to expend several hundred pounds per annum. The labouring classes in the time of Dutch prosperity were wont to partake largely of this national pride, and scarce a mechanic could be found who would sit down to his dinner without having a damask napkin to hang before him. The latter-day Hollander, however, has not such expensive tastes. The fact can be accounted for by the suffering brought upon these people through wars and the decadence of Dutch commerce. Consequently, in these days, there are comparatively few traces remaining of that high degree of domestic comfort to which this nation previously attained.

No. 239.

There are poems unwritten, and songs unsung,
  Sweeter than any that ever were heard—
Poems that wait for an angel tongue,
  Poems that but long for a Paradise bird;
Poems that ripple through lowliest lives,
  Poems unnoted and hidden away
Down in the souls where the beautiful thrives,
  Sweetly as flowers in the airs of May;
Poems that only the angels above us,
  Looking down deep in our hearts may behold—
Felt, though unseen, by the beings who love us,
  Written on lives as in letters of gold.

COMPOSITION TESTS.—STANDARDS VI. & VII. AND 1ST & 2ND YEAR P.T.'S.

Write at least 20 lines on ONE of the following :—

55. A letter as from a young man who has been travelling in China and Japan describing what he had seen in those countries ; OR
56. A letter to your Father about "Turning over a new leaf"; OR
57. A letter from a young man travelling in India, describing the cultivation of the Poppy, Indigo, Rice, or Tea ; OR
58. Say all you can about Fables and their uses. Illustrate by giving any Fable you can remember ; OR
59. Say what Coal and Iron have done for England ; OR
60. The difference between a Trade and a Profession ; OR
61. Say all you can about Thrift ; OR
62. Some of the most remarkable Inventions of the Nineteenth Century ; OR
63. A letter to your Cousin on our Colonial Possessions, showing which are useful for trade, which for emigration, and which for defence ; OR
64. The advantages of a Technical Education ; OR
65. The different modes of Artificial Lighting ; OR
66. Importance of the Telegraph and Telephone from a commercial point of view ; OR
67. A Fisherman's life ; OR
68. Describe any act of Heroism you have witnessed.

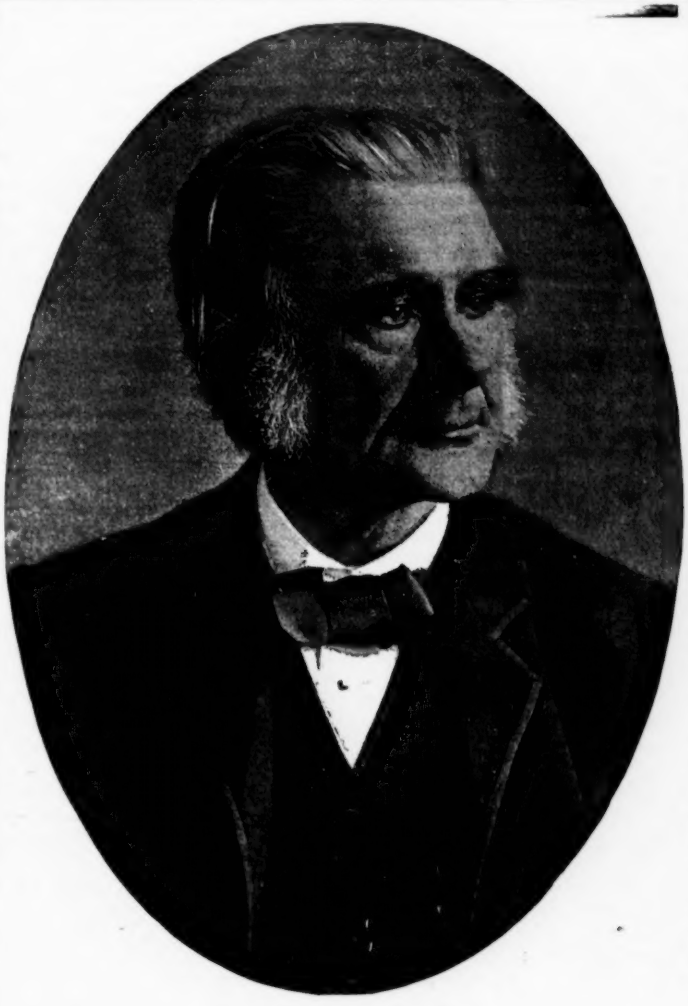
MODERN EDUCATIONAL REFORMERS.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),
Author of 'Mental Science and Logic for Teachers.' Late Director of the Birkbeck Training Classes and Lecturer therein on School Method.

No. XX.—THOMAS HENRY HUXLEY, M.D., LL.D., D.C.L., F.R.S.

ON the authority of Mr. Galton, the enthusiastic exponent of the dismal science of statistics, we are told that not more than one in four thousand may be expected to arrive at distinction, and that not more than one in a million may be endowed with 'some share of that intensity of instinctive aptitude, that burning thirst for excellence, which is called genius.'

That Prof. Huxley was one in a million few will be inclined to dispute. Most fortunate, therefore, was it for us that one so eminently well qualified for reforming education should incline towards the solution of the problem of popular education with a verve worthy of the pursuit. Other English philosophers of modern times have, in passing, turned towards the homely, yet vital, question of the proper education of the citizen, but Huxley and Spencer will in a future age be cited as the only giants of the Victorian era who have fixed upon the subject with bull-dog tenacity, applying themselves thereto with a vehemence that left no doubt as to their burning desire for a solution thereof. And of both these reformers it must be conceded that they have left their indelible mark upon educational thought and practice. It may be thought that Huxley felt himself impelled towards a discussion of how and what to teach because he was the son of one schoolmaster and, later on, because he was the father of another, and a lecturer himself. But so far as can be determined it seems rather that he became an educational reformer in virtue of his intense desire for the weal of his country, coupled with his unwavering conviction that the intelligent use of science was the one crying want in the schools of his country.



PROFESSOR HUXLEY.

(Reproduced from a photograph by special permission of the London Stereoscopic and Photographic Co., 54, Cheapside, E.C.)

Thomas Henry Huxley was born at Ealing, May 4th, 1825. His father was a master in a large middle-class school located in what was then rural Ealing, and Huxley naturally received his education in this temple of learning. Of this school the Professor, amiable man though he was, could say nothing good. 'The people who were set over us cared about as much for our intellectual and moral welfare as if they were baby-farmers,' he bitterly writes, affirming also that the society into which he fell at school was the worst he had ever known. Incidentally, he tells the story of how in late years he came across the school bully as a convict groom in New South Wales. We need hardly follow Huxley's career in anything but the barest outline. Although inclined towards mechanical engineering, he was placed with his brother-in-law to study medicine, and soon became enamoured of his first and lasting love, physiology, to wit, feeling an 'extraordinary attraction towards the study of the intricacies of living structure,' which no disagreeable experiences could dull, albeit the attendance at a *post-mortem* nearly cost the budding medico his life. He speaks with contempt of the teaching that he received both as a scholar at Ealing and also as a medical student, save only as concerns Mr. Wharton Jones, Lecturer in Physiology to Charing Cross Hospital. His course as a student being honourably completed, the newly-qualified Bachelor of Medicine entered into Her Majesty's service as Assistant Naval Surgeon, at first to the 'Victory' and then to the 'Rattlesnake.' The latter of these two vessels he accompanied on a scientific cruise, making important discoveries in

oceanic hydrozoa. Upon his return, in 1852, he was made a Fellow of the Royal Society, and occupied in succession the following offices:—1854, Professor of Natural History at the Royal School of Mines, which post he held for 31 years; 1855, Professor of Physiology to the Royal Institution; 1862, President of the Biological Section of the British Association; 1870, President of the British Association; Member of the first London School Board for two years; 1872, Lord Rector of Aberdeen University; 1873, Secretary of the Royal Society; 1878, LL.D. of London and of Dublin Universities; 1879, LL.D. of Cambridge; 1883, President of the Royal Society.

Ten years ago his health became very feeble in consequence of lung troubles and dyspepsia, from which latter complaint he was never wholly free. Recovering from this illness he, after resigning the whole of his appointments, settled down to a quiet life at Eastbourne, and to the busy pursuit of those objects which lay near to his heart. Amongst these was, in his own words, '*the popularisation of science and the development of organisation of scientific education.*'

It is an open secret that Prof. Huxley has refused many honours, albeit he has never shrunk from the acceptance of such positions as would enable him to help forward the good cause of scientific education. To this end he became in 1892 a Privy Councillor, and a year later delivered at Oxford the first lecture in commemoration of the late Prof. Romanes.

The story of the gradual sinking of the Professor, culminating in his death at Eastbourne on the afternoon of Saturday, June 29th, will be fresh in the minds of our readers, and the band of distinguished men of all shades of opinion, who gathered round the open grave in Finchley Cemetery was mute, yet withal eloquent, testimony to the greatness of the departed professor.

The miscellaneous works of Prof. Huxley have been issued by Messrs. Macmillan in nine volumes, whereof the third, under the title of 'Science and Education,' consists of the author's thoughts and suggestions upon education in all its phases, 'from' (to use Prof. Huxley's own expression, which, like Brougham's 'schoolmaster abroad,' has become proverbial) 'the gutter to the university.'

Wisdom, culture, enthusiastic earnestness, and intelligent constructiveness are to be met with on every page of the work, and one rises from a perusal thereof convinced that Prof. Huxley has not only diagnosed English education *du fond au comble*, but that he has shown rare skill and discretion in prescribing the remedial measures likely to remove the evils laid bare by his acumen.

Huxley shows how well qualified he is to appraise the educational value of a subject when he lays down the following heads under which the subject should be considered:—

(1) Its position and scope as a branch of knowledge;

(2) Its value as *a means of mental discipline;*
(3) Its worth *as practical information;*
(4) At what period it may best be made a branch of education.

Not less convincing is the definition of a liberal education:—'That man, I think, has had a liberal education who has been so trained in his youth that his body is the ready servant of his will, and does with ease and pleasure all the work that it is, as a mechanism, capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength and in smooth working order: ready, like a steam engine, to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of Nature and of the laws of her operations; one who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of Nature or of art, to hate all vileness, and to respect others as himself.'

And again, 'I take it that the whole object of education is in the first place, to train the faculties of the young in such a manner as to give their possessors the best chance of being happy and useful in their generation; and, in the second place, to furnish them with the most important portions of the immense capitalised experience of the human race which we call knowledge of various kinds. . . . . So that we are shut up to this—that the business of education is, in the first place, to provide the young with the means and the habit of observation; and, secondly, to supply the subject matter of knowledge either in the shape of science or of art, or of both combined.'

With such a conception of education before him, a teacher would possess an ideal eminently adapted to secure that all-round training on which properly balanced development depends.

Professor Huxley, in his chapter on 'The Value of the Natural History Sciences,' shows that the observing powers stand in need of much attention if one would be able to recognise to the full the beauties of nature, and he claims that observation is an instrument peculiarly well calculated to train the observing powers.

Let it not be thought that Huxley, like Spencer, would teach all sciences to everybody. By no means. Literature and art generally found in Professor Huxley an eloquent advocate. Let science be placed in the 'most favoured natural' conditions is his advice, *i.e., let it have as large a share of the time given to education as any other principal subject.*

And in order to make clearer what should be done in the first days of science teaching, Huxley lays down the following choice of subjects:—(1) Earth Knowledge [Physiography]; (2) Botany; (3) Physics, to which should be added, if possible, Chemistry and Physiology.

As to when this instruction should begin, the reply is ready, 'At the dawn of intelligence.' In other words, object lessons should serve as an introduction to the more advanced instruction in science, a view which is now becoming commendably common amongst us.

Bearing in mind the taunt which is always flung at the merely destructive critic, Professor Huxley does not abstain from constructing a curriculum or scheme of instruction which well merits serious attention:—'I should in the first place secure the training of the young in reading and writing, and in the habit of attention and observation. But in addition I should make it absolutely necessary for everybody, for a longer or shorter period, to learn to draw, the value of which I do not think can be exaggerated, because it gives you the means of training the young in *attention and accuracy, which are the two things in which all mankind are more deficient than in any other mental quality whatever.*

'I should naturally have no question about the teaching of physical science of the kind I have sketched in a practical manner. . . . I would also include the elements of the theory of morals and of that of political and social life.

'I would have the history of our own country, with incidental biography, not as a mere chronicle of reigns and battles, but as a chapter in the development of the race and the history of civilisation. Then with respect to æsthetic knowledge and discipline, we have happily in the English language one of the most magnificent storehouses of artistic beauty and of models of literary excellence which exists in the world at the present time. I have said before, and I repeat it here, that if a man cannot get literary culture of the highest kind out of his Bible, and Chaucer, and Shakespear, and Milton, and Hobbes, and Berkeley, he cannot get it out of anything; and I would assuredly devote a very large portion of the time of every English child to the careful study of the models of English writings of such varied and wonderful kinds as we possess. . . . . Nor would I fail to include, in the course of study I am sketching, translations of all the best works of antiquity or of the modern world. . . . Finally, I would add instruction in either music or painting, or if the child should be so unhappy as to have no faculty for either of these, then I would see what could be done with literature alone; but I would provide, in the fullest sense, for the development of the æsthetic side of mind.'

Against such a well-balanced curriculum as this it cannot be urged that undue prominence is given to science, and what immediately follows makes assurance double sure as to this point. 'If the educational time at our disposal were sufficient. . . . I should add, not more science, but one or, if possible, two languages (Latin and German).'

Such is the curriculum mapped out by Huxley, for which it may be claimed that it bears the impress of a practised pedagogue, showing undue favour to neither science nor to art, but utilising each in the attempt to secure proportion in development.

As to mere book-work in science, the Professor denounces it scathingly in his address to the students of Aberdeen University. 'For my own part I would not raise a finger, if I could thereby introduce mere bookwork in science into every Arts curriculum in the country. Let those who want to study books devote themselves to literature, in which we have the perfection of books both as to substance and as to form. If I may paraphrase Hobbes' well-known aphorism, I would say that "Books are the money of literature, but only the counters of science," science being the knowledge of facts, of which every verbal description is but an incomplete and symbolic expression.'

The just condemnation of too great a trust in examinations will be familiar to most of our readers. 'Examination, like fire, is a good servant but a bad master; and there seems to me to be some danger of its becoming our master. . . . Students work to pass, and not to know, and outraged Science takes her revenge. *They do pass, and they don't know. . . . . Under the best of circumstances I believe that examination will remain but an imperfect test of knowledge, and a still more imperfect test of capacity, while it tells next to nothing about a man's power as an investigator.*' And again, 'The educational abomination of desolation of the present day is the stimulation of young people to work at high pressure by incessant competitive examination. Some wise man (who was probably not an early riser) has said of early risers in general that they were conceited all the forenoon, and stupid all the afternoon. Now whether this is true of early risers in the common acceptation of the term or not I will not pretend to say; but it is too often true of the unhappy children who are forced to rise too early in their classes.'

In praise of the elementary school the Professor thus holds forth: 'Let any man of my age go into an ordinary elementary school, and unless he was unusually fortunate in his youth, he will tell you that the educational method, the intelligence, patience, and good temper on the teacher's part, which are now at the disposal of the veriest waifs and wastrels of society, are things of which he had no experience in those middle-class schools which were so injuriously contrived as to combine all the evils of the great public schools and none of their advantages. Many a man, whose so-called education has cost a good deal of valuable money and occupied many years of invaluable time, leaves the inspection of a well-ordered elementary school devoutly wishing that in his young days he had had the chance of being as well taught as those boys and girls are.'

Another of Prof. Huxley's strong points has already been hinted at, he would have the progress of able scholars hampered by no restrictions, pecuniary or otherwise, in the passage from the gutter to the university, and he solemnly warns the purblind economist of the folly of his action in blindly opposing the possible *début* of a man or woman of genius. '*I weigh my words when I say that if the nation could purchase a potential Watt, or Davy, or Faraday, at the cost of a* £100,000 *down, he would be dirt cheap at the money. It is a mere commonplace and everyday piece of knowledge that what these three men did has produced untold millions of wealth, in the narrowest economical sense of the word.*'

Concerning the training of teachers our author says some very biting things, which are, unfortunately, only too true, in the *Parable of the Bucket:* 'For the purpose of obtaining teachers of science and of technical classes, the system of catching a boy young, making a pupil teacher of him, compelling the poor little mortal to pour from his little bucket, into a still smaller bucket, that which has first been poured into it out of a big bucket; and passing him afterwards through a training college, where his life is devoted to filling the bucket from the pump from morning to night, without time for thought or reflection, *is a system which should not continue.*'

On the same subject of the necessity for having properly trained and well informed teachers we read as follows:—'There are a good many people who imagine that elementary teaching might be properly carried out by teachers provided only with elementary knowledge. *Let we assure you that that is the profoundest mistake in the world* . . . there is nobody so hard to teach properly and well as people who know nothing about a subject.'

Notwithstanding the inordinate length to which this essay has run, room must be found for the purport of Prof. Huxley's remarks on what is now termed the 'New Woman.' For her he has nothing but sympathy. 'So far from imposing artificial restrictions upon the acquirement of knowledge by women, throw every facility in their way. . . . Let them, if they so please, become merchants, barristers, politicians. Let them have a fair field, but let them understand, as the necessary correlative, that they are to have no favour. Let Nature alone sit high above the lists, "rain influence," and judge the prize.' The big chests, the massive brains, the vigorous muscles of the best men will carry the day, whenever it is worth while to contest the prizes of life with the best women. And the hardship of it is, that the very improvement of the women will lessen their chances. Better mothers will bring better sons. . . . The duty of man is to see that not a grain is piled upon the load beyond what Nature imposes; that injustice is not added to inequality.'

Exigencies of space now remorselessly compel us to close without detailing the part played by Prof. Huxley at the London School Board in the adoption of the 'Compromise,' without more than a word as to his advocacy of Bible reading in the Board Schools, without a word as to his work at the Science and Art Department.

A few days ago a meeting was held at the Royal Society in order to take steps to perpetuate Prof. Huxley's memory. We venture to suggest that no better or more appropriate means could possibly be found than the establishment of a school, so organised and managed as to give effect to the wise recommendations of him whose aim it was to become a 'New Reformer,' and who succeeded in becoming one of the most sagacious and far-seeing Educational Reformers of our era.

ELEMENTARY LESSONS IN AGRICULTURAL ZOOLOGY.

BY PROFESSOR J. R. GREEN, SC.D.,
Late Examiner in Botany to the University of Cambridge, and
F. L. GREEN,
Late Science Mistress in the Clifton High School.

CHAPTER VI.—INSECTS (*continued*).

THE first order of the insects we have seen is that of the Coleoptera, or Beetles. These are insects usually furnished with formidable mouthparts, adapted for biting. Their prothorax is strongly developed, and is so united with the mesothorax as to permit a free movement. There are four wings, of which only the two hinder ones are used for flight, the first pair being in the form of hard, often beautifully marked, covers which close over the others and protect them. These are named the *elytra*. The others are delicate in texture, light, and often transparent, and fold up when not in use.

The elytra cover not only the hind wings, but protect nearly the whole body, leaving exposed only the head and neck-shield and a little piece of the mesothorax, with, in some cases, also the tip of the

abdomen. The larvæ are either legless, or have only legs on the thoracic segments; their mouths, like those of the adult insects, are adapted for biting. The pupæ are of the kind called *free;* that is, having their case closely investing their body, so that every part of it can be distinguished. The metamorphosis is consequently *complete.*

There are very many families of the beetles which are of great importance from an agricultural point of view—generally being extremely inimical to the farmer. Their depredations are very varied, some attacking leaves and buds, others working underground and doing much damage to roots and the lower parts of stems. The larvæ are usually most destructive.

The Cockchafer, *Melolontha vulgaris*, stands perhaps at the head of these injurious beetles. From its birth, during a fairly prolonged life, it is always preying upon agricultural produce. Not only is the individual a very active pest, but the large numbers which are found render it very formidable. It is said that as many as eighty bushels of cockchafers have been collected in a single season upon a single farm.

The cockchafer deposits its eggs in the ground, and the grubs when hatched pass their existence for generally three years under the soil, feeding voraciously on the roots of grasses and various vegetables. They are of considerable size, and, like the adult chafer, are extremely clumsy. When they assume the pupa state, they live in earthern cells which the larva or grub constructs before undergoing the change. The perfect insects usually appear about May, but sometimes earlier. Their depredations are generally carried out in the evening, when they leave the ground and seek the neighbouring trees. They have a special liking for the buds and leaves of the oak, the horse-chestnut, the beech, poplar, willow, cherry, and other forest and fruit trees. The grubs, on the other hand, devour the grass and clover-roots in meadows, and in cultivated fields attack the roots of grain plants, peas and beans, rape, cabbage, etc.; in gardens they assail turnips and potatoes, and are particularly fond of the underground parts of strawberry plants.

In appearance the head, neck-shield, entire ventral surface, and legs are black or reddish brown; the head always being dark. The antennæ are plumose, the club having seven large segments or leaflets in the male, and six smaller ones in the female. Many specimens of the insect are thickly clothed with numerous white hairs, while others are almost hairless.

In countries where the cockchafer is most abundant, its appearance is intermittent, every third or fourth year being a 'chafer year,' when the beetles appear in millions. This is to be associated with the length of life of the larva; in some countries this takes three years, in others four years, to come to maturity. In the intermediate years they are hardly to be found at all.

Part of the harm which is done by the larva of this beetle is quite irremediable; for burrowing as it does along underground it escapes observation until the signs of its presence are seen in the withering of the plants which it attacks. It is then too late to do anything. Fortunately it has many enemies in the insectivorous birds, which—particularly the rook—have a faculty for discovering the whereabouts of the pest, and sufficient strength of beak to enable them to extract the depredators from their underground abode.

Another member of the same family, *Cetonia aurata*, the Rose Chafer, is a serious enemy to roses, eating into the hearts of the flowers whilst they are in bud. Failing roses, it has a strong liking for the flowers of the strawberry, and sometimes it is very destructive to the flowers of the turnip when these are left for seed. The grub, too, is very troublesome; it has an existence of two or three years' duration, and all that time it feeds upon the roots of strawberry plants and cultivated grasses. The grub of this beetle is white in colour, about an inch and a half long; it has six short legs, which are practically useless for the purpose of locomotion. It can be distinguished from the larva of the cockchafer by having a horny plate upon each side of the second segment of its body and by being clothed by rows of hairs. Like the latter, it passes its pupa stage underground, in a kind of cell or cocoon of its own construction. Both pass from the pupa stage to that of the perfect insect some months before the latter resumes activity.

The Rose chafer is a brilliant insect, having a metallic green coloured coat, the wing cases being decorated with white spots. Below it is of a copper colour, and covered with long yellowish hairs.

The Click Beetle, or skipjack, is one of the most troublesome insects with which the farmer is acquainted, its larva being the creature popularly known as the *wireworm*. This common or popular name, as is so often the case, is often very much abused, being made to cover very often all subterranean grubs which the finder cannot identify. There are very many species, however, which have a right to the name, but only about five of them are sufficiently plentiful to call for special attention as inimical to agriculture. Of the others some are distinctly beneficial, attacking decaying wood and thus helping to clear away what is an eyesore and open out space for fresh and vigorous growths. The true wireworm has a long cylindrical body and six legs, which are placed in the segments nearest the head. It thus belongs to the class of grubs, and should not be called by a name which suggests a totally different relationship. When mature it becomes a beetle, which is known as a *skipjack* on account of the way in which it regains its feet if it should happen to fall on its back.

The grub, or wireworm, is a yellowish brown, shining, cylindrical insect, furnished with a very tough hard skin, which protects its wearer from damage if subject accidentally to very great pressure. So strong is this coating that if the insect be trodden on, while on ordinary soil, it is merely pressed uninjured into the ground. It is subterranean in its mode of life, and carries on its predatory operations for about three years before becoming a pupa. Its six legs are very small, and are of very little use to it for purposes of locomotion. It has in addition a pair of somewhat important sucker-feet, which are placed just above its tail. Its segments are fringed by a number of stiff bristles, on which it relies rather than on its legs for making its way through the soil. The female skipjack lays its eggs upon or near a root, so that, as soon as it is hatched, the young wireworm finds something into which it can burrow, and soon it is occupied in feeding, which it does very voraciously, upon the succulent tissue; generally confining its depredations to a part well below the surface. The wireworm is more destructive in dry soil than in wet, infesting very commonly meadows and grass land. It devours all underground parts, but specially prefers fleshy parts of plants, such as potatoes and turnips. It eats also the underground stems of grain plants, working itself up from the soil often into the inside of the lower part of the haulm of the grass. In very young seedlings of cereals it is found to destroy the region of the stem that extends from the remains of the seed to the surface of the ground, causing of course the death of the plant. When the haulm of the grass has been attacked, the first sign of the damage is the turning yellow of the lower leaves, and the injury so indicated is irremediable. Plants which rise from seeds sown at but a little depth are least easily killed; there is in them a smaller piece of stem exposed to the insect's attack; moreover shallow-sown plants develop earlier than deep-sown ones a strong mass of roots, and so can offer a greater resistance to the destructive influence. The insect is very voracious, but its depredations are rendered more extensive by its habit of moving from root to root, not completing the destruction of the one it first attacks, but speedily assailing others in the neighbourhood. Besides grasses, it is very fond of all kinds of fleshy underground vegetables, eating indiscriminately potatoes, mangolds, turnips, and artichokes.

The life of the grub, as already mentioned, extends over three to five years, and during the whole of this time it continues its devastations. In the winter it burrows deeper into the soil, sometimes penetrating nearly a foot, and so protecting itself from the cold and frost of the season. In some cases it may be found nearer the surface, often only an inch or two below it. When they burrow deep into the soil they pass the winter in a state of torpor, reviving and becoming active again with the return of spring.

The transformation into the pupa stage takes place usually at some depth in the soil, where the grubs construct for themselves small earthern cells something like those of the chafers. They remain in these in the pupa form for some months, appearing as beetles in the following summer.

The adult insect, as already mentioned, is known as the *skipjack*. It is a longish insect, of equal breadth all along, bluntish at the hind end. The neck shield is strongly developed; the antennæ are made up of three-cornered joints. It bears on the under side a spine, which may be seen on the hinder margin of the prothorax, and in the mesothorax is a furrow in which the spine lies when the body is extended. When the prothorax and mesothorax are lifted up from anything on which they happen to rest, the spine is drawn out of the furrow. A skip jack that has fallen on its back first draws its antennæ and legs close to its body, and then bends this in such a way that the head and prothorax make an angle with the rest of the thorax and the abdomen. In this way the junction of the prothorax and mesothorax is lifted up, and the spine drawn as far as possible out of the furrow. The insect then lifts the two ends of the body, and presses the spine forcibly back into the furrow, causing it to be jerked against the ground with such a shock that its elasticity makes it spring into the air, where it turns over and comes down again on to its ventral surface.

There are four of these skip jacks which may commonly be met with.

Agriotes lineatus is a clumsy insect about one-third of an inch long, brown in colour, and not showing any very variegated markings. Each wing-case is yellowish brown, and bears four longitudinal stripes of rather darker brown. These stripes are bordered by rows of rather deep punctations, which are distinctive of the species.

Agriotes sputator. This is a smaller insect than the last. It has a black head, a black thorax with yellow base and apex, and light yellowish-brown elytra.

Agriotes obscurus. This is larger than either of the others and more clumsily built. The head and thorax are blackish, and the wing cases are dark brown.

Athous hæmorrhoidalis. This is a long narrow beetle, with blackish head and thorax, but with lighter wing covers.

Against the depredations of wire-worms the agriculturist is almost helpless. They cannot be reached by any means available, and the only remedy is found in the numerous insectivorous birds which search for them. Various washes and other applications of an insecticidal character have been recommended, but the influence of the soil upon the supposed remedy generally renders it innocuous by the time that it reaches the whereabouts of the insects. Sometimes the damage can be materially lessened by offering them attractive baits, which lure the grubs from their ordinary food, and so collect them into one place, where they can be found and destroyed. Pieces of potato, carrot, or rape-cake may be buried in the infested soil, and searched once or twice a week, when they will be found to have attracted numbers of the grubs. The preservation of the ordinary insectivorous birds is, however, the desideratum to which the farmer must look for material aid.

(*To be continued.*)

CONVERSATIONAL LESSONS IN CHEMISTRY.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

First Class Honoursman in Chemistry, S. and A. Department, Lecturer in Chemistry to the Middlesex County Council, Late Lecturer in Physiography to the Birkbeck Institution, Chancery Lane, E.C.

For particulars of the List of Chemicals and PRACTICAL TEACHER Set of Apparatus for working the experiments referred to in these lessons see numbers for January and February 1893.

LESSON XXIV.—TIN.

HERE are some very everyday objects to which I wish to draw your attention, as they have something in common—a looking-glass, a cake-tin, a bell, a pewter pot, a stick of solder, and a Britannia metal tea-pot. Here is the something which they all have in common. What is it, Trixie? It looks somewhat like lead, sir. But it is not lead, as you can readily see now that I place a piece of lead by the side of the strange metal. No, this silvery-white body is tin, and tin is the subject of our lesson to-day. In what part of England is tin found, Charlie? It is found in Cornwall, sir. Yes, and we are told that long before the birth of Christ the merchants of Tyre and Sidon used to come to the Scilly Isles to procure this useful element, for which good reason they called these islands the Cassiterides, or Tin Islands. You will next want to know whether it is found free or in combination, and here is the answer to your question. This reddish coloured stone is the form under which tin occurs in large masses. Is this tin? No, sir; it is an ore of tin. Very true, it is the oxide, and from it is obtained all the tin that is used in commerce. Can you tell me, Phil, how the metal is separated from tinstone? Remember that it is an oxide, so that we have only to find a body that will combine with the oxygen and release the metal from its combination. Well, Maud, what do you think? Will not carbon do, sir? Just the very thing, Maud. All that we need do is to heat the tinstone with anthracite coal, and the carbon will combine with the O, setting free the tin thus—

$$SnO_2 + 2C = 2CO + Sn.$$

Now let us experiment with our tin. Let Lilla try to cut our specimen. Can you do it, Lilla? Yes, sir. Very good; then tin is a soft metal, but not so soft as lead. Hold the lead in one hand and the tin in the other, Trixie. What do you observe? Lead is heavier than tin, sir. Yes, the specific gravity of tin is only about 7, whereas that of lead, as we have before learnt, is more than 11. Now take this iron spoon, Tom, and place some tin in it, then hold the spoon over the Bunsen burner. See, it melts; so that for a metal it has rather a low melting point, viz., about twice the boiling point of water. What is this scum that has formed on the top of the molten metal? Is it not the oxide, sir? Yes, Charlie; and we learn from this that tin oxidises readily when it is in the molten state. Now for a marvel. See, I pour out the molten tin into a mortar, and before it has time to cool I beat it with the pestle, and lo! the liquid has become a powder. But, on the other hand, let the molten mass cool, and then hammer it with the pestle, and behold! the metal is no longer brittle, but highly malleable, and capable of being hammered out into the thin sheets known as tinfoil, a specimen of which I here exhibit. Let us now turn to the looking-glass and see how that is made. A layer of tinfoil is laid on a smooth table. Upon this is poured some mercury, then upon the layer of alloyed mercury and tin is placed the glass, which at once is silvered, and a mirror results. The cake-tin is made of sheet iron which has been dipped in molten tin, a layer of which adheres to the iron and gives it the beautiful silvery appearance with which you are all familiar. Perhaps Fred will tell us why we go to so much trouble with the sheet iron. What is the use of covering it with tin? Well, we will try you, Winnie. It makes it look cleaner and nicer, sir. Yes; and it makes it keep nicer, too, because the tin does not rust nearly so quickly as the iron. *Bell metal* we have already dealt with in our lesson on copper. Like *bronze* and *gun metal*, it is an alloy of copper and tin. *Pewter*, *solder* and *Britannia metal* are alloys of tin and lead. There is no metal more useful in alloy forming than tin. Not only is tin useful to the brazier and the plumber, it is also valued by the dyer as a *mordant*. To understand this you must know that there are some substances that will not take the dyes. Such substances are immersed in solutions which will adhere to the fibres of the body to be dyed, and as that dye will readily adhere to the body in which the article has been dipped, it is easy to see how it may be dyed. The body thus behaving as a kind of go-between to the dye and the fabric required to be dyed it is called a *mordant*—or a biter—because it bites the dye into the fabric.

One of the compounds of sodium and tin is an excellent mordant, highly valued by the dyer.

The artist is also under an obligation to tin, for tin sulphide is of a beautiful yellow colour, and is used by the artist under the name of *mosaic gold*.

Tin therefore is a very useful metal for alloying, for dyeing, for colouring, and for making mirrors and tinfoil. It is found as oxide in large quantities, but only in a few favoured localities, of which Cornwall is one.

NOTES AND NOTIONS.

BY RICHARD WADDINGTON.

THOUSANDS of teachers eagerly awaited the result of the elections in at least three constituencies. Of West Nottingham and North-West Ham teachers had been talking and thinking for well nigh three years. But when, a week before the poll, Mr. Macnamara entered the field against Mr. Darling, the member for Deptford, the eagerness became acute. The hero of the last School Board contest entered at short notice upon a difficult task, but teachers recognising the ability and energy of the doughty 'Mac' felt that the fight in Deptford would be keen—and may be successful. The campaign opened enthusiastically. By Saturday all was in train, and Mr. Marshall Jackman, acting as Mr. Macnamara's election agent, found himself supported by an army of teachers bent on sending the Vice-President to St. Stephen's with as effective a vote as the vote which returned him last November as a member of

the School Board. Nottingham was safe, but what about West Ham?

* * * * *

THAT Mr. Gray should be disarmed and prostrate while the battle raged was as painful to Mr. Gray as it was advantageous to his opponent. But North-West Ham has done its duty. I congratulate Mr. Gray, and I congratulate the constituency. It is a glorious victory. At last we have a teacher taken direct from the school to the House of Commons. Despite Mr. Macnamara's failure to oust Mr. Darling, there is little doubt that the day is not distant when he will join Mr. Gray at St. Stephen's. Of Mr. Yoxall we feel there is little doubt that he will long continue member for West Nottingham. It has been weary waiting, especially for those members of the Union who were keenly anxious to get direct Parliamentary representation. But the fruition is generally attained only after much labour. With two such able representatives as Messrs. Gray and Yoxall the case of the teacher will be safe in the next House of Commons. In the name of every reader of the PRACTICAL TEACHER, aye, in the name of every teacher in the Union, I may offer hearty congratulations and good wishes to Messrs. Gray and Yoxall.

* * * * *

THERE is little doubt that the Unionists will have a good working majority when the elections are over. This will give them opportunity for dealing with—

1. Superannuation.
2. Reasonable Security of Tenure.
3. Child Labour.
4. Secondary Education.
5. Voluntary Schools.

From the change of Government I do not think teachers have much to lose. On the first three of these planks in our platform Sir John Gorst is as likely to succeed as Mr. Acland, notwithstanding Mr. Acland's deep sympathy and keen interest. And I imagine Sir John Gorst will have fewer 'fads' to bring as necessary and compulsory parts of the curriculum. I am not sure that in education the country cannot do with a Minister of Education who does not believe that all the 'arts and crafts' must be taught to every boy and girl, regardless of the length of the school life of the children.

* * * * *

THE suggested list of Object Lessons issued by the Education Department can hardly be condemned on the ground of its lack of comprehension. A veritable cyclopædia of general information that would suffice for children of much larger growth than the much to be pitied occupants of the first three standards in our Primary Schools. As an outline of what everybody ought to know it is admirable, but as a series of possible courses for the first three standards of the Primary Schools it is simply appalling. It is the fate of every new move of the educational faddist to ignore the already overburdened curriculum. One can understand the seven year-old first standarder,

> 'His cogitative faculties immers'd
> In cogibundity of cogitation,'

after a few doses of the latest Whitehall Course of Mental Training. Well might teachers reiterate Punch's query, 'Is there anybody at Whitehall who has seen a child?' To ask teachers to even scurry through these lessons in addition to Suitable Occupations, and all the other thousand and one requirements of the present day, is not only inconsiderate but is uneducational.

* * * * *

'WHAT shall I do?' is the query that I am face to face with week by week. I shall make out a reasonable and workable list that can be comfortably accomplished, and that will not unduly stress either teacher or taught. It will be much shorter than any of the schemes suggested. My motto will be to aim at doing a little well rather than to produce a great array of lessons indifferently dealt with. If teachers are only honest during the next year a much more rational view of the possibilities will pertain. But if the effort to 'box the compass' to please the Inspector is to continue, then all is lost without a doubt. I shall lay down the heads of the lessons, and have them ready for presentation to the Inspector as a record of work accomplished. I shall trust to the members for West Ham and West Nottingham to bring home to 'the powers that be' the utter impossibility, as well as the undesirability, of attempting so much as is suggested by the recent circular, which ought to be a real and living object lesson to the non-Unionist—a lesson that one almost despairs of succeeding.

* * * * *

PERHAPS I might aid some of my readers if I give the list of object lessons I am taking in the first three standards in place of Geography:—

(*a*) *Plant life.*
1. The study of plants as growing things.
2. The study of plants as growing things.
3. Blossoms, fruits, seeds, and leaves.
4. Blossoms, fruits, seeds, and leaves.
5. How plants are adapted to their surroundings.
6. How plants are adapted to their surroundings.

(*b*) *Animal life.*
7. The cat and its big cousins.
8. The horse.
9. A fish.
10. The frog.
11. The fly.
12. The sparrow.
13. Birds of passage.

(*c*) *Common objects.*
14. Metals and minerals.
15. Coal.
16. Iron.
17. Chalk.
18. Porous bodies—cork.
19. The sponge.
20. Soap.
21. A penknife.
22. A bobbin of cotton.
23. A ship.
24. The compass.

(*d*) *Natural phenomena.*
25. Sunrise, noon, and sunset.
26. The air in motion.
27. Clouds.
28. Rain.
29. A rainbow.
30. Snow.

* * * * *

No claim to special excellence is made for this list. Several of the lessons are taken because concrete illustration is at hand. For the first year the same course is prescribed for Standards I., II., and III.,

Agriotes sputator. This is a smaller insect than the last. It has a black head, a black thorax with yellow base and apex, and light yellowish-brown elytra.

Agriotes obscurus. This is larger than either of the others and more clumsily built. The head and thorax are blackish, and the wing cases are dark brown.

Athous hæmorrhoidalis. This is a long narrow beetle, with blackish head and thorax, but with lighter wing covers.

Against the depredations of wire-worms the agriculturist is almost helpless. They cannot be reached by any means available, and the only remedy is found in the numerous insectivorous birds which search for them. Various washes and other applications of an insecticidal character have been recommended, but the influence of the soil upon the supposed remedy generally renders it innocuous by the time that it reaches the whereabouts of the insects. Sometimes the damage can be materially lessened by offering them attractive baits, which lure the grubs from their ordinary food, and so collect them into one place, where they can be found and destroyed. Pieces of potato, carrot, or rape-cake may be buried in the infested soil, and searched once or twice a week, when they will be found to have attracted numbers of the grubs. The preservation of the ordinary insectivorous birds is, however, the desideratum to which the farmer must look for material aid.

(*To be continued.*)

CONVERSATIONAL LESSONS IN CHEMISTRY.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

First Class Honoursman in Chemistry, S. and A. Department, Lecturer in Chemistry to the Middlesex County Council, Late Lecturer in Physiography to the Birkbeck Institution, Chancery Lane, E.C.

For particulars of the List of Chemicals and PRACTICAL TEACHER Set of Apparatus for working the experiments referred to in these lessons see numbers for January and February 1893.

LESSON XXIV.—TIN.

HERE are some very everyday objects to which I wish to draw your attention, as they have something in common—a looking-glass, a cake-tin, a bell, a pewter pot, a stick of solder, and a Britannia metal tea-pot. Here is the something which they all have in common. What is it, Trixie? It looks somewhat like lead, sir. But it is not lead, as you can readily see now that I place a piece of lead by the side of the strange metal. No, this silvery-white body is tin, and tin is the subject of our lesson to-day. In what part of England is tin found, Charlie? It is found in Cornwall, sir. Yes, and we are told that long before the birth of Christ the merchants of Tyre and Sidon used to come to the Scilly Isles to procure this useful element, for which good reason they called these islands the Cassiterides, or Tin Islands. You will next want to know whether it is found free or in combination, and here is the answer to your question. This reddish coloured stone is the form under which tin occurs in large masses. Is this tin? No, sir; it is an ore of tin. Very true, it is the oxide, and from it is obtained all the tin that is used in commerce. Can you tell me, Phil, how the metal is separated from tinstone? Remember that it is an oxide, so that we have only to find a body that will combine with the oxygen and release the metal from its combination. Well, Maud, what do you think? Will not carbon do, sir? Just the very thing, Maud. All that we need do is to heat the tinstone with anthracite coal, and the carbon will combine with the O, setting free the tin thus—

$$SnO_2 + 2C = 2CO + Sn.$$

Now let us experiment with our tin. Let Lilla try to cut our specimen. Can you do it, Lilla? Yes, sir. Very good; then tin is a soft metal, but not so soft as lead. Hold the lead in one hand and the tin in the other, Trixie. What do you observe? Lead is heavier than tin, sir. Yes, the specific gravity of tin is only about 7, whereas that of lead, as we have before learnt, is more than 11. Now take this iron spoon, Tom, and place some tin in it, then hold the spoon over the Bunsen burner. See, it melts; so that for a metal it has rather a low melting point, viz., about twice the boiling point of water. What is this scum that has formed on the top of the molten metal? Is it not the oxide, sir? Yes, Charlie; and we learn from this that tin oxidises readily when it is in the molten state. Now for a marvel. See, I pour out the molten tin into a mortar, and before it has time to cool I beat it with the pestle, and lo! the liquid has become a powder. But, on the other hand, let the molten mass cool, and then hammer it with the pestle, and behold! the metal is no longer brittle, but highly malleable, and capable of being hammered out into the thin sheets known as tinfoil, a specimen of which I here exhibit. Let us now turn to the looking-glass and see how that is made. A layer of tinfoil is laid on a smooth table. Upon this is poured some mercury, then upon the layer of alloyed mercury and tin is placed the glass, which at once is silvered, and a mirror results. The cake-tin is made of sheet iron which has been dipped in molten tin, a layer of which adheres to the iron and gives it the beautiful silvery appearance with which you are all familiar. Perhaps Fred will tell us why we go to so much trouble with the sheet iron. What is the use of covering it with tin? Well, we will try you, Winnie. It makes it look cleaner and nicer, sir. Yes; and it makes it keep nicer, too, because the tin does not rust nearly so quickly as the iron. *Bell metal* we have already dealt with in our lesson on copper. Like *bronze* and *gun metal*, it is an alloy of copper and tin. *Pewter*, *solder* and *Britannia metal* are alloys of tin and lead. There is no metal more useful in alloy forming than tin. Not only is tin useful to the brazier and the plumber, it is also valued by the dyer as a *mordant*. To understand this you must know that there are some substances that will not take the dyes. Such substances are immersed in solutions which will adhere to the fibres of the body to be dyed, and as that dye will readily adhere to the body in which the article has been dipped, it is easy to see how it may be dyed. The body thus behaving as a kind of go-between to the dye and the fabric required to be dyed it is called a *mordant*—or a biter—because it bites the dye into the fabric.

One of the compounds of sodium and tin is an excellent mordant, highly valued by the dyer.

The artist is also under an obligation to tin, for tin sulphide is of a beautiful yellow colour, and is used by the artist under the name of *mosaic gold*.

Tin therefore is a very useful metal for alloying, for dyeing, for colouring, and for making mirrors and tinfoil. It is found as oxide in large quantities, but only in a few favoured localities, of which Cornwall is one.

NOTES AND NOTIONS.

BY RICHARD WADDINGTON.

THOUSANDS of teachers eagerly awaited the result of the elections in at least three constituencies. Of West Nottingham and North-West Ham teachers had been talking and thinking for well nigh three years. But when, a week before the poll, Mr. Macnamara entered the field against Mr. Darling, the member for Deptford, the eagerness became acute. The hero of the last School Board contest entered at short notice upon a difficult task, but teachers recognising the ability and energy of the doughty 'Mac' felt that the fight in Deptford would be keen—and may be successful. The campaign opened enthusiastically. By Saturday all was in train, and Mr. Marshall Jackman, acting as Mr. Macnamara's election agent, found himself supported by an army of teachers bent on sending the Vice-President to St. Stephen's with as effective a vote as the vote which returned him last November as a member of

the School Board. Nottingham was safe, but what about West Ham?

* * * * *

That Mr. Gray should be disarmed and prostrate while the battle raged was as painful to Mr. Gray as it was advantageous to his opponent. But North-West Ham has done its duty. I congratulate Mr. Gray, and I congratulate the constituency. It is a glorious victory. At last we have a teacher taken direct from the school to the House of Commons. Despite Mr. Macnamara's failure to oust Mr. Darling, there is little doubt that the day is not distant when he will join Mr. Gray at St. Stephen's. Of Mr. Yoxall we feel there is little doubt that he will long continue member for West Nottingham. It has been weary waiting, especially for those members of the Union who were keenly anxious to get direct Parliamentary representation. But the fruition is generally attained only after much labour. With two such able representatives as Messrs. Gray and Yoxall the case of the teacher will be safe in the next House of Commons. In the name of every reader of the Practical Teacher, aye, in the name of every teacher in the Union, I may offer hearty congratulations and good wishes to Messrs. Gray and Yoxall.

* * * * *

There is little doubt that the Unionists will have a good working majority when the elections are over. This will give them opportunity for dealing with—

1. Superannuation.
2. Reasonable Security of Tenure.
3. Child Labour.
4. Secondary Education.
5. Voluntary Schools.

From the change of Government I do not think teachers have much to lose. On the first three of these planks in our platform Sir John Gorst is as likely to succeed as Mr. Acland, notwithstanding Mr. Acland's deep sympathy and keen interest. And I imagine Sir John Gorst will have fewer 'fads' to bring as necessary and compulsory parts of the curriculum. I am not sure that in education the country cannot do with a Minister of Education who does not believe that all the 'arts and crafts' must be taught to every boy and girl, regardless of the length of the school life of the children.

* * * * *

The suggested list of Object Lessons issued by the Education Department can hardly be condemned on the ground of its lack of comprehension. A veritable cyclopædia of general information that would suffice for children of much larger growth than the much to be pitied occupants of the first three standards in our Primary Schools. As an outline of what everybody ought to know it is admirable, but as a series of possible courses for the first three standards of the Primary Schools it is simply appalling. It is the fate of every new move of the educational faddist to ignore the already overburdened curriculum. One can understand the seven year-old first standarder,

> 'His cogitative faculties immers'd
> In cogibundity of cogitation,'

after a few doses of the latest Whitehall Course of Mental Training. Well might teachers reiterate Punch's query, 'Is there anybody at Whitehall who has seen a child?' To ask teachers to even scurry through these lessons in addition to Suitable Occupations, and all the other thousand and one requirements of the present day, is not only inconsiderate but is uneducational.

* * * * *

'What shall I do?' is the query that I am face to face with week by week. I shall make out a reasonable and workable list that can be comfortably accomplished, and that will not unduly stress either teacher or taught. It will be much shorter than any of the schemes suggested. My motto will be to aim at doing a little well rather than to produce a great array of lessons indifferently dealt with. If teachers are only honest during the next year a much more rational view of the possibilities will pertain. But if the effort to 'box the compass' to please the Inspector is to continue, then all is lost without a doubt. I shall lay down the heads of the lessons, and have them ready for presentation to the Inspector as a record of work accomplished. I shall trust to the members for West Ham and West Nottingham to bring home to 'the powers that be' the utter impossibility, as well as the undesirability, of attempting so much as is suggested by the recent circular, which ought to be a real and living object lesson to the non-Unionist—a lesson that one almost despairs of succeeding.

* * * * *

Perhaps I might aid some of my readers if I give the list of object lessons I am taking in the first three standards in place of Geography:—

(*a*) *Plant life.*
1. The study of plants as growing things.
2. The study of plants as growing things.
3. Blossoms, fruits, seeds, and leaves.
4. Blossoms, fruits, seeds, and leaves.
5. How plants are adapted to their surroundings.
6. How plants are adapted to their surroundings.

(*b*) *Animal life.*
7. The cat and its big cousins.
8. The horse.
9. A fish.
10. The frog.
11. The fly.
12. The sparrow.
13. Birds of passage.

(*c*) *Common objects.*
14. Metals and minerals.
15. Coal.
16. Iron.
17. Chalk.
18. Porous bodies—cork.
19. The sponge.
20. Soap.
21. A penknife.
22. A bobbin of cotton.
23. A ship.
24. The compass.

(*d*) *Natural phenomena.*
25. Sunrise, noon, and sunset.
26. The air in motion.
27. Clouds.
28. Rain.
29. A rainbow.
30. Snow.

* * * * *

No claim to special excellence is made for this list. Several of the lessons are taken because concrete illustration is at hand. For the first year the same course is prescribed for Standards I., II., and III.,

as the work is new to all. Next year a second course will be required for Standards II. and III. The new course need not be entirely new, and our course will admit of the extension of many of the subjects. Teachers cannot too fully realise the necessity of not attempting too much. The most pleasing feature of the Circular on Object Lessons is its emphasis of the necessity of doing a little well. The circular contains some admirable hints on the arrangement and scope of these lessons. The list looks formidably like the index of a cyclopædia of all things under the sun, yet when examined and considered as suggestive, with the clear instruction that you need not attempt more than can be reasonably accomplished, the list loses much of its terror. Throughout the circular there breathes a spirit of anxiety to help that gives hope that the enforcement of object lessons will not be regardless of the possibilities of the teachers and taught.

* * * * *

'Woes cluster; rare are solitary woes;
They love a train, they tread each other's heel.'

Truly the train of woes have trod each other's heels since my last 'Notes and Notions' were written. Day by day I scanned my morning paper with feverish anxiety for news of Superannuation and the Half-Timer. It was known that Mr. Acland had the consent of the Treasury to take the first reading of the Superannuation Bill, and the raising of the age for half-timers to twelve was felt to be a certain result of the passage of the Factory Act. The unexpected happens in politics as in cricket. The Government were defeated, and the introduction of the Superannuation Bill was out of the question. 'Hope springs eternal in the human breast,' and there was still the Factory Bill. The cry of Clogland might still be answered. And it might have been, had not certain members of the Grand Committee on Trade not made it known that they would fight against raising the age, even if it wrecked the Bill. The children were sacrificed—the children are ineffective at the ballot box, and the appeal to the ballot box is nigh. Let us hope that so effective will be the influence of the teachers during the election, that we shall get thirteen as the age next year.

* * * * *

How great was the disappointment to thousands of the teachers there is no doubt. Many have been hanging on in the hope that a Superannuation Bill will be passed this year. To men like Mr. Ellery, who wrought might and main, the bitterness of the disappointment requires to be experienced to be fully realised. But the promise of Sir Michael Hicks-Beach on the question of the Superannuation of Teachers shows how true is the statement that our cause is as safe in the hands of one party as the other. The cause is so far advanced that, whatever be the result of the elections, legislation cannot be long delayed. Nay, it is just possible that the effect of the interviewing during the past few days may give an impetus to the movement. How much the teachers of the North of England have lost by the suddenness of the Dissolution is fully recognised. My friends were suggesting that I should be lonely without the half-timer. It was a loneliness that I am grieved to find deferred. Only tears of joy would have been shed over the end of the half-timer. But with Sir John Gorst or Mr. Acland the cause is equally safe, and within measurable distance of success.

* * * * *

Mr. Acland's retirement from Whitehall is a matter on which there will be mixed feelings. That he has done much to magnify the office he held everybody will admit, and that he was equally bent on the amelioration of the conditions of primary education will hardly be contested. A man of pronounced educational opinions must always leave his mark at Whitehall. Mr. Acland's administration has been marked by wide sympathy and much success. His whole effort has been the betterment of the schools of the people. Teachers have much to thank him for. And yet there are things he might well have left undone in the interests of the schools. Compulsory Object Lessons and Suitable Occupations do much to mar the good opinion teachers hold of his tenure. But in bidding adieu to Mr. Acland the teachers of England are losing a friend whose heart and soul are in the work of education, and who has accomplished much that will make his occupancy of the Vice-Presidency memorable. The Acland Codes for Day and Evening Schools will have an important and far-reaching influence on the schools of the next decade.

* * * * *

To their old friend, Sir William Hart Dyke, the teachers turned when the Government of Lord Salisbury was in course of construction. Without marring in any way the welcome given to Sir John Gorst, it can be truly said that the voice of pedagogy uttered only one name for Mr. Acland's successor—and that was Mr. Acland's predecessor. But, failing Sir William, no better appointment could have been made than that of Sir John Gorst. He is essentially a man of the people. His efforts to carry out the Berlin Pledge to raise the age for half-timers to twelve, during the Committee stage of the Factory Bill, fill me with hope that he will heed the cry of the children. He possesses two essential qualifications for his office—wide sympathy and few fads. Let us hope that Sir John will listen to the voice of reason on the question of Object Lessons and Suitable Occupations, and make these optional instead of compulsory subjects. He has a golden opportunity to score at the very outset of his career, and I am sanguine that when the appeal is made it will not be made in vain.

* * * * *

Why is Sir John left out of the Cabinet? With the Government pledged to a great educational reform not less important than the Act of 1870, one would have felt that Lord Salisbury would have felt the absolute necessity of including the Minister of Education in the Cabinet. But the fact that Mr. Acland was a member of the late Cabinet makes the omission all the more inexplicable. True, Sir William Hart Dyke was not a member of the Cabinet when the Assisted Education Act was passed, but in that case the Opposition were in accord with the Cabinet. The case of increased Aid for Voluntary Schools is not analogous. The Opposition will keenly contest the Bill when introduced. From the non-inclusion of Sir John, it would appear

that the intention to seriously legislate on the education problem is somewhat remote. I regret the non-inclusion on other grounds none the less. The Minister of Education ought to be sufficiently important to secure inclusion within the Cabinet. With Superannuation, State Aid, and child labour within the range of practical politics, the omission is to be regretted by every educationist.

* * * * *

And the case for increased aid for Voluntary Schools grows apace. So keen is the demand in the North of England that men of all shades of opinion are pledging themselves to give aid in some form. It is to be keenly regretted that the Executive of the N.U.T. did not include this in its list of queries to candidates. The volume of opinion is becoming too great to be long resisted, and it is a pity that the teachers should not be heard clearly and loudly proclaiming the necessity for ending the present inequality. Why should I be receiving considerably less than my next door neighbour who happens to work under a School Board? The chief bar to educational progress lies in the certainty that every additional burden placed on the school finances must be borne by the teachers. The chief danger to the Board School teacher lies in the unsatisfactory conditions of the Voluntary teachers. There can be no doubt that the question is within the range of practical politics, and it is necessary, in the interests of the teachers, that they should take active part in the formulation of the scheme to be presented. By whatever name the system of education is styled, it is the duty of the State to ensure its efficiency.

* * * * *

The Organisation Conferences were extremely successful. Urban and suburban officials of the N.U.T. were fully represented at each centre, vieing with each other in the discovery of new methods of driving home the necessity for Unionism. No departure of recent times is so likely to have such far-reaching effect as these conferences. Every local organisation, large or small, town or rural, successful or unsuccessful, will find something worth adopting in the suggestions made by the various secretaries and presidents. The mere bringing of these officials together must do much to make Unionism stronger. The experiment was worth making, and I feel sure the expenditure is 'bread cast upon the water.' The absence of women struck me as remarkable, knowing as I do the keen interest they often take in Unionism. And it is to the women that we want to appeal more directly. The women non-members are the weakness of the Union. It is through the women members we must get to the women non-members. That we shall get 30,000 for Brighton goes without saying, but it ought to be possible to go to Brighton with a roll of 35,000 members. And so it will be if every member will scratch one new member.

* * * * *

The List of School Districts in England and Wales with the standards fixed by the bye-laws of each district, revised to March 1895, is far from pleasant reading. The exemption standards are lamentably low, and the question arises whether the Department ought not to do something to accelerate the upward movement in standard fixing. Notwithstanding the twenty year old Education Act of 1876, for it was not until 1876 that the fixing of standards was made compulsory, there are eleven districts where no standard is fixed for full time employment, and twenty-three districts where compulsion is only enforced between the ages of five and eleven. Of course every teacher knows that in actual practice the number of districts where compulsion is only nominally in force runs into four figures, but these are openly avowed breakers of the Act, which says that children must attend school between five and fourteen except under certain specified conditions. At present about 60 per cent. adopt the fourth as the full time exemption standard at eleven years of age, and only three districts the seventh standard. Herein lies scope for Sir John Gorst if he returns to Whitehall after the election.

'DOCTOR DAYMOND'S GRAMMAR BOYS.'

A SEQUEL TO 'THE SQUIRE'S BIRTHDAY.'

BY JOSEPH DESPICHT.

Author of 'Should Men Wear Hats?' 'In 1999,' etc.

Characters :—

Doctor Daymond - -	Head Master of Grammar School.
Albert Dawes - - -	Head Boy.
William Durling - -	'The Young Squire.'
'Shrimps' (Fred. Nelson) -	A boy in the Grammar School.
Clarence Beaufort - -	An Old Boy of the Grammar School.

Sixth Form Boys, *ad lib.*

Scene.—A class-room in Doctor Daymond's Grammar School.

Time.—9.30 a.m.

Discovered : The Sixth Form boys awaiting the Doctor's arrival—all seated on two rows of benches opposite rostrum R.

Albert Dawes (*Captain of School, looking at his watch*) : Half-past nine, and the Doctor not here. What's in the wind, I wonder? The Doctor's never late, except he has a castigation affair on.

Arthur Blackwell : I fancy some of the youngsters are on the carpet for breaking bounds. If so, my beauties, we have a clear fifteen minutes to enjoy ourselves in.

William Warren : It can't be illness, for the Doctor looked as sound as a bell, and as right as a trivet at chapel this morning.

Frederick Nelson : Perhaps I can clear the matter up. Just before class I was taking the air, or, if you like, playing at marbles in the quad, when I saw the postman arrive at the Doctor's private door. Knowing that Boots always answers his professional knock, I dashed up and asked pretty loudly if Mr. Postman always kept for himself the five-pound notes that were being continually sent to me, when who should appear in answer to the postman's summons but the Doctor himself. He seemed in a great hurry to get the letters, and his hand trembled visibly as he glanced at the addresses. What can be up?

Fred Lord : Oh, that was only for fear of a dun for his washer-woman's bill! Let's proceed to business.

William Hammond : Right you are! One supposition is as good as another. The Doctor may have the measles; he may be giving a youngster forty stripes with his tongue, or he may have received bad news; but what is certain is, that he's late, and it's our privilege and duty to enjoy ourselves.

Dawes (*Head boy*) : Well, you boys all know that from time immemorial it has been the custom of the Sixth Form here, whenever the Doctor has not turned up punctually to lecture, at once to improve the time by electing one of themselves to take the Doctor's place during his absence, upon which it becomes the duty of the one selected to, impromptu, lecture the others, and woe-betide him if he fails to acquit himself satisfactorily.

All : Hear, hear! Hear, hear! (*Knock on desk with rulers.*)

Dawes (*Head boy*) : I therefore propose that William Durling, our future squire, be requested to take the pedagogic chair.

All : Hear, hear! Hear, hear!

Blackwell : I beg to second that, and in seconding the proposition of my Rt. Honourable Chum——

All : Sit down ! sit down ! No speeches ! Look at the time.

(*Several force him back into his seat.*)

Dawes : Those who vote for Durling signify the same in the usual manner.

All : All ! All !

Dawes : On the contrary ?

All : None, none ! Up with him.

(*Four boys carry him to chair. He strikes them with pointer as they retire.*)

Dawes : Carried by a minority of four. One word more. Mind, I'm your captain ; an unworthy one I know——

All : No, no ! (*One boy,* '*Don't mention it!*')

Dawes : I'm responsible for seeing that no real mischief takes place. And no word against the Doctor, mind—he's ill for all we know. To spare his feelings, and our own, will Rose remain on the watch, and let us know when the study door bangs.

William Rose : I'll watch like Argus, with a hundred eyes. (*Goes to class-room door, L.*) All right. Fire away, Squire.

William Durling (*standing on Head Master's chair*) : 'My Lords'——

All : Bravo ! bravo !

(*Long continued, while Durling bows right and left as he stands on the chair.*)

Cyril Stubbings : Not so much noise, lads ; the masters will hear us in the other wing. Go on, *young man.*

Durling : 'My lords and gentlemen, the atrocious crime of being a young man'——

Rose (*darting back from class-room door*) : Chatham ! Chatham !

(*Retires rapidly ; several boys threaten him.*)

Several : Chatham, Chatham ! Be original, Billy.

Durling : Unaccustomed as I am to public speaking——

Rose (*darting back as before*) : Heard it before. (*Retires as before.*)

All or several : Heard it before. Shame, shame ! (*Threaten with rulers.*)

A. Green : Try again, Grand Old William.

Durling (*like an Examiner*) : My dear little boys, I propose this morning——

Baker (*the smallest boy present*) : How dare you call us little boys ?

All : Withdraw, withdraw !

Durling (*like a Professor*) : Gentlemen of the Jury, I propose this morning to examine you on the history of mankind, from the beginning of the world to the end, and after that——

Wm. Ellum : Nonsense, sir, there's nothing after that.

Durling : And after that, ignoramus, we'll begin again at the beginning.

Rose (*darting back*) : Bravo, Squire ! (*Retires rapidly.*)

All : Bravo, Durling ! that'll do, go on.

Durling : Now you are all aware that when Stanley went to Africa in the dark, to discover another hemisphere, he said something. Now what young gentleman can tell me what he said ?

All (*one after another*) : Give it up, sir.

Rose (*darting back*) : Give it up. (*Retires as before.*)

Durling (*blandly*) : Well, my children, you all give it up. Now, Stanley said—and he nailed it to the top of the mast, that all the natives might read it—'England expects that every man will do his duty.'

Rose : Good again, Squire !

All : Hear, hear ! (*and laughter.*)

Durling : My next question is this : When William the Conqueror landed in Britain a few weeks ago, and was opposed by our own brave volunteers, armed to the teeth with full haversacks, what words of fire did he address to his followers ? You may answer in English if the Greek does not occur to you.

Rose (*darting back*) : Give it up. (*Retires.*)

Blackwell (*putting up hand*) : I have it, sir.

Durling : Well ?

Blackwell (*striking an attitude*) : Up guards, and eat 'em !

All : Hear, hear ! (*and laughter.*)

Durling : Undoubtedly right. Now, my last question is—and it has been asked men even more famous than yourselves (*all cough*); it has been asked over and over again, and will be asked when we (*takes out handkerchief and pretends to cry*)——

All : Question ! Question !

Durling : Well, the question is—'Who killed Cock Robin ?'

All (*looking at one another*) : Who—killed—Cock Robin ?

Durling : Don't hurry, dears—take time to think.

All : Who—killed—Cock Robin ?

Rose (*darting back*) : Did you say 'Who killed Cock Robin ?'

Durling : Yes.

Rose : Give it up. (*Retires, as before.*)

Several : Give it up.

Durling : Well, I am surprised ! Great boys like you !

Baker (*standing up*) : If you please, sir, I used to know, but I forget.

Durling : Forget, sir ? You ought to be ashamed of yourself ! I'm astonished ! Let me see, I'm afraid I forget what question I asked.

Rose (*darting back as before*) : Shame ! Shame ! (*Retires.*)

All : Who killed Cock Robin, Dominie ?

Durling : Now surely you cannot all have forgotten. Hands up the naughty boys who forget who killed Cock Robin. (*Half put up hands.*) And now hands up the dear good boys who don't forget who killed Cock Robin. (*Other half put up hands.*) That's right ! Well, those who *don't* forget can tell those who *do*. Good morning ! (*Goes to get down.*)

All, or several : Keep him in the chair ! (*Two hold him and keep guard.*)

W. Warren : Shall we duck him in the pond ?

All : Hear, hear !

Nelson : Put him under the pump !

All : Hear, hear !

Baker : Write to his grandmother !

All : That's better !

Rose (*darting in*) : Make him stand tarts all round !

All : That's it ! That's it !

Durling : Thank you, gentlemen, for your very kind remarks; and now, for the excellent way you have this morning gone through your Humanities, and for the brilliant manner in which you have forgotten all the Rudiments, I give the noble Sixth Form a month's holiday. You may all go home to the mater. Get out ! (*Goes to get down, but is prevented by boys on guard.*)

All : Bravo, Doctor ! Bravo, Squire ! Bravo, Chicken !

Lord : I say, let's have the 'Dulce Domum' !

All : Yes, yes, yes ! The 'Dulce Domum' !

(*All stand as if to sing—Durling picks up pointer, which should be made of paper, and taps the nearest boy smartly on the head with it to command attention—Someone strikes chord on piano or harmonium.*)

Rose (*darting in*) : Hush ! He's coming !

All (*like a groan*) : Oh !

Rose : No, he isn't ! It's all right !

Dawes (*taking him by the collar*) : Get back, you young scamp !

(* *All sing 1st verse of the 'Dulce Domum'—Durling beats time with the pointer with a long and sweeping beat. At every second beat of the bar the boy on guard on the left 'ducks' to avoid the stick, and at every third beat the boy on the right does the same. At the last beat of the final bar Durling succeeds in giving both boys a good crack.*)

All (*in a subdued tone*) : Hooray ! Hooray ! Hooray !

Warren : Let's pelt him !

(*All crumple up exercise paper and throw at Durling, who tries to ward off the pellets with his pointer.*)

Rose (*mysteriously*) : Hush ! Hush ! Here ! (*Comes to centre of stage.*)

All (*some crowding round*) : What is it ? What's the matter ?

Rose : The Doctor ! ! !

All, or several : Why didn't you say so before ? Quick !

(*All scramble to places, picking up the paper lying about and stuff it in their pockets. They take out a book each and begin to study hard.*)

(*Enter Doctor Daymond.*)

That's right, boys ! I'm glad to find you are going on. I've had some important correspondence that has detained me. Let me see. What is it this morning ?

Dawes (*head boy*) : Translation of Prudentius, and recitation, sir. I am afraid we have not worked as hard as we might in your absence, but we'll make up for it now. You look pale, sir ! I hope your correspondence contained no bad news !

Doctor : Well, no, and yes ! It's an old saw that things are never so bad but that they might be worse, nor ever so good but they might be better. Some of the news I meant to speak to you about later on, but I may as well do it now, for it closely concerns you all. (*Takes up two letters.*) One letter is, as it were, from the dead still living, the other from the living already dead. You all, I dare say, remember an old scholar of the Grammar School named Clarence Beaufort.

Dawes (*head boy*) : Oh, yes ; he was head boy one year, and we youngsters then admired him immensely.

Blackwell : I remember him, too, sir. The boys nicknamed him 'My lord' ; he was so distinguished-looking.

* The 'Dulce Domum,' as sung at Winchester and elsewhere, may be got at Novello's, Berners Street, W. It is sung at the 'breaking up.'

Warren: I believe he was accused of some dreadful crime, and had to fly the country, had he not, sir?

Doctor: Yes, you are all right. He protested his innocence to me, and I to this day believe him. A nature like his, with so much affection in it has no room for crime. However, everything seemed so clear against him, that his nearest and dearest friends begged him, at least for a time, to quit the country. Reluctantly he at last consented to do so.

Stubbings: He went to the Diggings, did he not, sir?

Doctor: Yes, where he thought he should be forgotten soonest. Since then—five years ago—he was eighteen at the time—no one has heard of him but me. This morning a letter came, as I anticipated, by the Australian Mail, telling me of his fixed intent to return as soon as possible, and give himself up to justice, come what may.

Nelson: We'll stand up for him, sir. We don't care what the lawyers say, if you say he's innocent.

Several Boys: We'll get him off, sir!

Doctor (smiling): Well, boys, fortunately your powers will not be put to the test; for my other letter is from a lawyer announcing that a man, who owned much property about here, has made a death-bed confession, that it was he who committed the crime of which poor Clarence was, and is, utterly and entirely innocent.

All: Bravo! bravo!

Nelson: May I go and look for him, sir?

Doctor: He may be still at the Antipodes, and that's rather a long walk for a little chap like you. No, boys, we must wait patiently, but I want you to keep your eyes and ears open for any signs of him.

Nelson: I loved him, sir, and I shall find him! Four years ago, when I was in the upper second, he was like a big brother to me, and thrashed many a bully on my account! For fun he called me 'Shrimps' because I'm so small, (*The Doctor and boys laugh.*)

Doctor: There, boys, I have told you the news, good and bad, and now go straight on with the recitation. Let me see, what is the subject?

Dawes: A translation, sir, of Prudentius' 'The Emperor and the Toad.'

Doctor: Oh, yes; I know it. Begin yourself.

(*Dawes recites.*)

'The Emperor and the Toad.'

(*This may be divided into portions and given to several boys, or the first two stanzas may be omitted.*)

(1.)

Great Constantine was Emperor at Rome—
Licinius, his co-mate on the throne.
And Constantine was noble, gentle, kind—
Licinius, ambitious, cruel, faithless.
And th' Emperor was brother-in-law to him,
Licinius, whose kinship was a curse:
For long the Emperor had bared his thoughts,
His very soul, to him who would betray.
Then troubles came in floods, as thunder banks
Pour down destruction on the fruitful plain.
No cloud passed o'er with frowns content, but each
And every one cast forth its awful wealth
Of tempest, fire, or fury! About his throne
His rivals gathered near, as jackals do
When lions are to die. Maxentius,
The boldest and the worst, had come so close
To victory, that one of them must fall.
And subjects once so loyal, 'neath the ban
Of vile oppression, of taxes raised
To feed Licinius's thirst for gold,
Now wore the rebel's doubly hateful mask,
And secret plotted both's destruction.

(2.)

Horror to add on horror, woe on woe,
The Goths from out the North, a barb'rous horde
Of semi-savages, upon the land
Came pouring down in countless myriads,
Like locusts with insatiate appetites,
Leaving a wasted ruin on their way;
Or as the forest fire, with mad-like bounds
And hissing shrieks, leaps on, devouring what
Alone might let it live, so did the Goths
With suicidal rage make bare the land
That might hava nurtured Rome and them,
And Constantine could nought that might avail,
For still he trusted false Licinius.

(3.)

One morn at noon, from out the Senate Hall
The Emperor passed to his own royal villa;
Within the grounds of which a pretty lake
Was filled by Tiber's stream. And near at hand
A grotto cool upreared its shell-like form—
A perfect place of peaceful solitude.
To this retreat came Constantine the Good
In thoughtful mood, like one oppressed with weight
Of many cares. This colleague on the throne,
This kinsman, thought he, is he friend or fiend?—
His counsel always wise—always disastrous!
Could mind of man so subtly make *and mar?*
No, no! such doubts were treachery to his friend,
And he would banish them!

(4.)

Still on him weighed
The heavy load of painful memories:
The Goths, Sarmatians, fell civil war,
His rivals' claims, his loyal subjects' woe;
When, as he mused, a low harsh croaking cry,
Repeated oft, would strike upon his ear;
And looking down he saw a slimy toad
That croaked and croaked upon the grotto's floor!
'So croak' said he aloud, 'my enemies!
And dost thou join the number, wretched thing,
By breaking thus this welcome solitude?
Out, out, base reptile!' Saying so, his foot
He raised, as he would spurn the noisome brute;
But ere the blow could fall, two anxious eyes—
He thought one instant's space that they were human—
Two eyes that called for pity met his own.
That moment all the goodness of his heart
Returned. He stooped and took the clammy mass
Into his hand, and drew it to his breast,
As love would make amends for needless pain.

(5.)

When lo! another wonder! Next he saw
Between the creature's eyes a jewel set—
A gem of wondrous beauty! No diamond it,
No sapphire, ruby, pearl, or amethyst,
And yet at times each one, at times them all
Commingled in a sphere of wondrous light,
Whose brilliant hues the rainbow's more than rivalled.
Forth from the grotto's grateful shade he stepped,
And to the border of the lake he came
In haste, like one on mercy's errand bent.
Then to the toad he said, 'Poor quiv'ring thing!
Perhaps among thy kind *thou* art a king . . . .—
A king, and banished by a rival's hate . . . . !
Some treachery has worked, for on thy brow
Is set the Holy Gem of Innocence.
Go back, and with its light thy subjects bless.'

(6.)

Thus said, among the reedy leaves that grew
Where little water was, he gently threw
The strangely jewelled toad. When, as it sank,
From out the placid bosom of the lake
Uprose a lovely form of beauty rare,
And yet so God-like haman! In its hand
It held a cross aloft, and on the cross
Was writ in heaven's own language—all may read—
'He never will suffer the righteous to fall;
He is at thy right hand.' Upon its brow,
'Tween eyes that beamed out Perfect Love, he saw
The Jewel Rare of Perfect Innocence.
Then thus the vision spoke: 'Beware, O King,
Of false Licinius. His cruel hand
And faithless heart are of this land the curse.
Let him be banishèd! Reign thou alone!
Fear God, and love thy subjects as thyself,
And then in all thou shalt be conqueror!'
Straightway the vision rose into the sky
And no more came to Constantine. But he,
Remembering all, Licinius put forth—
So conquest followed conquest, rivals fell,
And all the land had peace.

(*After the recitation a murmur of approval is heard from the boys.*)

Several boys : Well done ! Well said!

Doctor : Very good ! very good ! The English is your own I can hear. One sentence you have lamentably misconstrued. I will write it on the board that all may see. In the 4th stanza Prudentius has it this way (*turns his back to the boys and begins to write 'In hoc vince' on black board.*)

(*Enter Clarence Beaufort, very pale, unkempt, clothes extremely shabby and travel stained.*)

Clarence (*gasping*) : Water ! water ! For Blessed Charity ! (*Falls fainting. The boys all shrink from him except Nelson, who pours out some water into a glass on the Doctor's table—the Doctor stands irresolute.*)

Several boys : It's a thief ! It's a thief !

Green : It's one of those wretched tramps, perhaps !

Rose : It's a gipsy !

Baker : Shall I go for the constable, sir ?

Doctor (*opening and looking at letters*) : Wait a bit. Let me think ! Let me think !

Nelson : I say, don't let us leave him there to die. Perhaps he's only poor, and not wicked after all. I caught a glimpse of his face as he fell, and there was the jewel of innocence on his brow. Think of the Emperor and the Toad ! (*Goes to him and supports his head on his knee.*) Wake up, my man ! Here, drink this ! Drink ! drink ! He's too far gone, I fear. (*Wets handkerchief and bathes his forehead—The Doctor and some of the boys come near.*)

Clarence (*opening his eyes gradually, and speaking very slowly*) : Halloa, young Shrimps ! is that you ?

Nelson : 'Shrimps !' why—sir—sir, it's Clarence—Clarence Beaufort ; look, look, look, I said I should find him, and I have!

All (*drawing nearer*) : Clarence, Clarence Beaufort ?

Nelson : Here, drink this, old fellow ! (*giving him water.*) Drink a lot of it (*as he drinks*), there's plenty more in the pump !

Clarence : There, there, I'm better now ; thanks, old boy, that's delicious.

Doctor (*stooping down to him*) : Clarence, my boy, is it really you ? I know it is though I ask. How pleased I am to see you. You look utterly exhausted. Rest on me—rest on me. Are you stronger now ? Try and stand, there's a good fellow. (*Helps him to rise—Shrimps remains on his left.*)

Clarence : That's all right ! I feel a bit shaky, though ! Just a little more of 'Shrimps' Cordial,' and I shall be as fit as a fiddle !

Nelson (*giving water*) : Mind it doesn't get into your head, now ! But are you very ill ? (*Puts arm round him and looks in his face.*)

Clarence : No ! no ! I was all right till I put my foot over the threshold of the old place. I then thought I should die before I reached the Doctor, although I could hear his voice ! And then I don't know what happened, till I seemed to wake up after a long sleep, and saw Shrimps' face bending over me, and the face of an angel could not have been more welcome !

Nelson : Take a little more—do now. (*Clarence sips.*)

Doctor : You could not have come at a better moment, Clarence —just when you are wanted.

Clarence (*angrily*) : Wanted ! Who wants me ? The police ? They won't want long ! I tell you, I've come to give myself up ! Doctor, you and this youngster always said I was innocent. Don't, don't, don't desert me now !

Nelson : I won't, I'll stick to you like a ——

Dawes (*Head boy*) : Like a shrimp ! (*A general laugh.*)

Nelson (*to Clarence*) : Don't be so impatient, listen to Doctor Daymond.

Doctor : I want you, Clarence—everybody wants you, except the police, and they would be very glad to wash their hands of you. Are you strong enough to hear very good news ?

Nelson (*brings a chair*) : Take a chair, Clarence ! I'll have the water handy.

Clarence : No ! no ! There'll be no more fainting ! A fellow who has had three years in the bush doesn't faint twice in a hurry. Shrimps' Elixir has put new life in me. I've been used to *bad* news, surely a little change will do me good !

Doctor (*showing letters*) : Well, Clarence, I received a letter this morning, in which you are proclaimed before the world, and upon the surest testimony, an innocent man ! (*Clarence starts.*)

Nelson (*offering water*) : Oh ! do take a drop—I can see you're off ! (*Clarence refuses.*)

Clarence : Innocent, sir ! Go on ! Explain ! Explain !

Doctor : This letter contains the confession of one that is dead, stating that he, and he alone, committed the crime of which you were believed to be guilty.

All : Bravo ! bravo ! cheer up, old boy !

Nelson (*to Clarence who looks dazed*) : I said so ! take a little more ! (*Offering him water.*)

Clarence : No ! no ! keep it, Shrimps ! you'll want it yourself to swim in ! No, I don't mean that ! What do I mean, I wonder ? I've come all these thousands of miles to give myself up, and now there's nothing to give myself up for. It's a swindle, Doctor ! I'd better go back !

Nelson (*holding him*) : Not if I know it ! I've found you, my precious jewel, and I mean to keep you ! But I say, old fellow, who's your tailor, and how much do you owe your laundress ? That gold mine of yours is coming on in your luggage I suppose ! We took you for a tramp ?

Clarence : Well you weren't far wrong ! It's many a weary mile I've tramped to reach the dear old Doctor again. I'm afraid, sir, that my letters, though they were true, did not contain the whole truth. I tried to keep a good heart out yonder as well as I could, but bad luck seemed to follow me from the beginning. What little money I took with me, I soon lost with some artful speculators, and at last I was forced to work as a labourer in the Australian bush.

Nelson : Refreshments ? (*Clarence refuses.*)

Blackwell : I suppose they didn't called you 'My lord' there.

Clarence : Not a bit ! My mother, had she been alive and there, would hardly have known me ! No doubt the horrible false accusation hung like a cloud over me, and I always felt a bit of a coward for running away. (*Almost sinks into chair.*)

Nelson (*offering him water*) : You're going ! (*Clarence sips water.*)

Doctor : No ! no ! my boy, time was your only hope !

Clarence : Well, to make a long story short, and to show what queer things sometimes shape our lives, one night I sat thinking of old times, and the Doctor and school, when I mechanically took up pencil and paper, and began making funny sentences out of a long word—a game, sir, that I dare say the boys play at now.

Several : Hear ! hear ! Yes, yes !

Clarence : Well, all of a sudden out of one long word popped this sentence :—'See the Doctor, and try Shrimps.' And this kept beating on my brain, day after day—day after day—from the Bush to the port—on board the ship I worked my passage home in—tramping from London here—with food or without food—always ran in my mind the queer direction, 'See the Doctor, and try Shrimps,' and—and—here I am.

Nelson : Just a thimbleful ! (*Clarence sips a little water.*)

Doctor : And here or here-abouts you are likely to stop. For here is another letter with an enclosure, to be opened by no one but you—read it.

Clarence : A lawyer's letter ! (reads) : Extract from the will of the late Thomas Malfaire, Esq., 'In order to make some reparation to Clarence Beaufort for the terrible wrong I did him, I appoint him sole heir and successor to my estate in Devonshire.' Can it be true ?

Nelson : Some one fetch a bucket—he's off.

All : Hooray ! hooray !

Doctor (*takes his hand*) : It is true, for it is also in the newspaper to-day. I am sure you will deserve your good fortune.

Clarence : I shall only accept the estate on this condition, that my younger brother here, Shrimps, accepts one half of it, that his good natured heart may teach me how best to deserve the trust imposed upon me !

Nelson (*putting hand on shoulder*) : I'll do whatever you like, Clarence, but I'll never be parted from you any more !

All : Bravo ! Bravo, Shrimps !

Doctor : It's lucky you came when you did, Beaufort, for in two days more the school would have broken up, and the boys been off for their holidays.

Clarence : Doctor, dear Doctor, you are all a bit unfit for work, and I shall want your advice in many things. May I beg of you to let the Sixth Form break up now, on the spot ! Let me hear the dear old 'Dulce Domum' once again, for this is indeed 'Home, Sweet Home' to me.

Nelson : Drink it up, old boy ! (*Clarence drinks.*)

Doctor Daymond : I see no objection if the boys do not ! Eh !

All : Oh, no, sir !

Dr. D. (*to Head boy*) : Will they remember 'The Dulce Domum,' Mr. Dawes ?

Dawes : Oh, I think so, Sir ?

(*All sing 1st verse of the 'Dulce Domum,' the Doctor gently marking the time with his hand. Clarence sinks into a chair as if overcome by the singing, but rises again, and joins heartily the cheering.*)

Clarence (*after 'Dulce Domum'*) : Now, boys, three cheers for the Old School—God bless it ! (*Cheers.*)

Nelson : Three cheers for Doctor Daymond ! (*Cheers.*)

Baker : Three cheers for Shrimps ! (*Laughter and Cheers.*)

(*Curtain.*)

EXAMINATION IN GEOMETRICAL DRAWING, WITH SOLUTIONS.

April 27th, 1895.

Plane Geometry.

1. The given line AB represents a length of 15 yards. Construct a scale of yards by which single yards may be measured up to 40 yards. The scale must be correctly figured. (10.)

2. Draw an isosceles right-angled triangle, having its equal sides $2\frac{1}{2}$" long. Within the triangle inscribe *two* equal circles each touching the other and two sides of the triangle. (10.)

3. Draw the pattern shown (including the dotted lines). The arcs are all to be of $\frac{1}{2}$" radius. (10.)
No marks will be given for reproducing the diagram the same size.

4. Construct a regular heptagon of $1\frac{3}{8}$" side, and within it inscribe a circle. (12.)

5. The diagonals of a parallelogram are $2\frac{1}{2}$" and 2" long respectively, and are perpendicular to one another. Construct the figure, and a similar parallelogram of 2" side having its sides parallel to and equidistant from those of the first. (10.)

6. O is a point within a quadrilateral figure ABCD. Construct the figure from the following dimensions:—

Angles—AOB = 115°, BOC = 65°, AOD = 85°
Lengths—OA = $1\frac{1}{4}$", OB = $1\frac{5}{8}$", BC = $1\frac{3}{4}$", BD = 3".

Reduce the quadrilateral to an isosceles triangle of equal area, having AB for base. (14.)

7. Draw the figure from the given radii.
No marks will be given for a mere reproduction of the diagram. (12.)

8. Draw a line AB 3" long, and describe two circles, each of $\frac{3}{4}$" radius, *touching* AB at A and B respectively. Then describe a third circle, of 1" radius, touching both the other circles. (10.)

9. Find, and mark clearly, the third proportionals, greater and less, to two lines $1\frac{1}{2}$" and $2\frac{1}{4}$" long. (8.)

10. Construct a triangle having its sides in the ratio 5 : 4 : 2, the longest side being $2\frac{3}{4}$" long. (8.)

Solid Geometry.

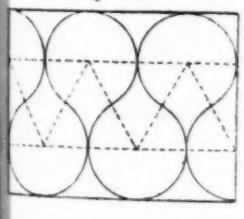
11. ABCD is the plan of a box without a lid, $1\frac{1}{4}$" high, made of material of uniform thickness. Draw an elevation on the line *xy*, showing a section of the box made by the vertical plane represented in plan by the line *ef*. (16.)

12. The figure is the elevation of a solid composed of two truncated cones. Draw its plan, and show upon the given elevation the section made by a vertical plane passing through the axis AB of the solid, and inclined at 45° to the vertical plane of projection. (12.)

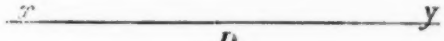
13. A right prism has for base a regular hexagon of $1\frac{1}{2}$" side, and its axis is 1" long. Draw an elevation of the prism standing with one rectangular face on the ground, the planes of the bases making angles of 45° with the vertical plane of projection. (14.)

N.B.—The diagrams referring to Questions 1, 11, *and* 12 *are to be pricked off or accurately transferred to the paper.*

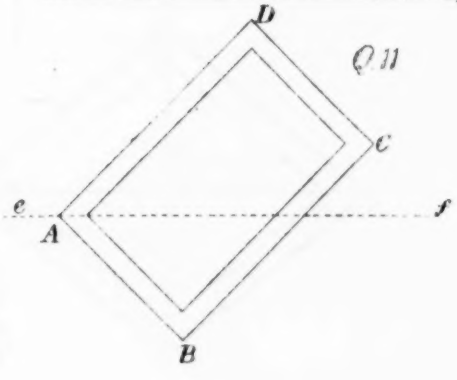
Q. 3.

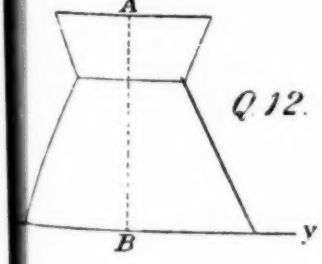


Q. 1.



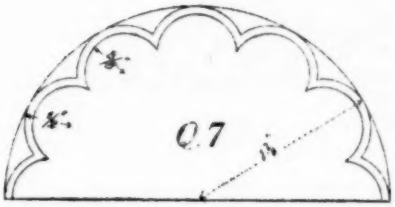
Q. 11.

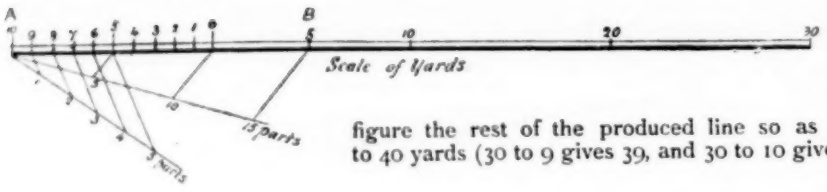




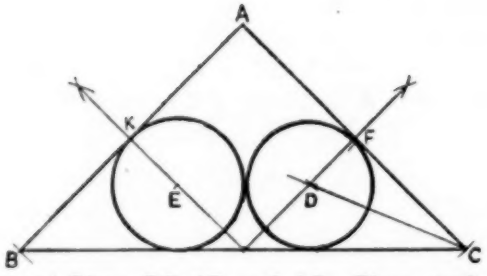
Q. 12.

Q. 7.

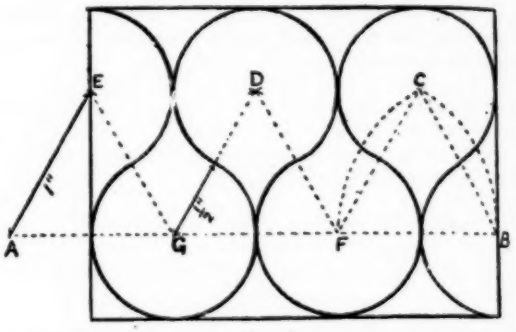




(1.) Draw the line given in the diagram and produce it indefinitely. Divide the part AB, representing 15 yards, as shown, and figure the rest of the produced line so as to give measurements up to 40 yards (30 to 9 gives 39, and 30 to 10 gives 40 yards).



(2.) Bisect BC, AB, and AC. Bisect angle ACB giving D, the centre of one of the circles. KE = FD.

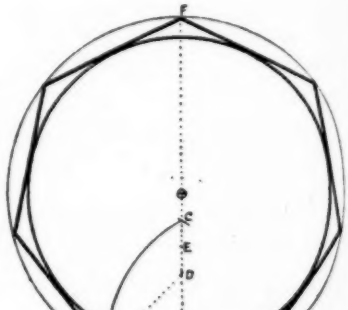


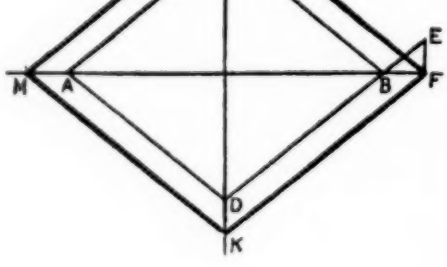
(3.) Draw a line AB, 3 inches long, and with a radius of 1 inch describe arcs FC, BC, etc., to obtain the centres C, D, E, F, G. Describe the arcs of the figure with a radius of half an inch, and afterwards draw the tangential straight lines.

(4.) Draw AB $1\frac{5}{8}$ inches long. Draw the perpendicular FK any length. DK = AK, AC = AB. C is the centre of a hexagon with AB as side. D is the centre of a square with AB as side. So E, half-way between C and D, is the centre of a pentagon, and O the centre of a heptagon with AB as side.

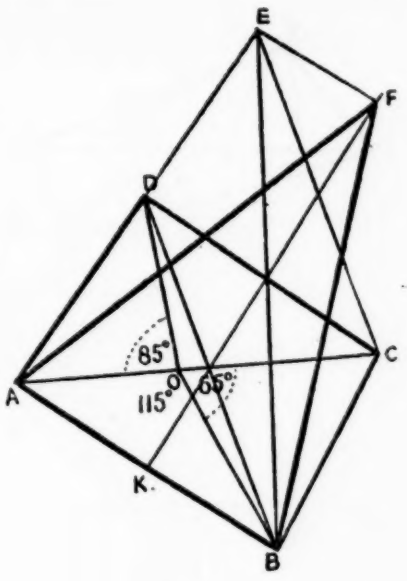
With centre O and distance OA, describe the circle AFB.

With centre O and distance OK, describe the inner circle. Mark the distance AB six times along the arc AFB and join the points.



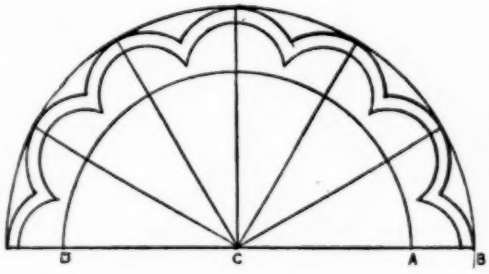


(5) Draw the diagonals AB and CD at right angles to each other, and produce them indefinitely. Produce one *side*, DB, of the parallelogram so as to make it 2 inches long. From E draw a perpendicular line EF to AB produced. Make FL, FK, ML, MK each 2 inches long, or parallel to the sides of the smaller parallelogram.



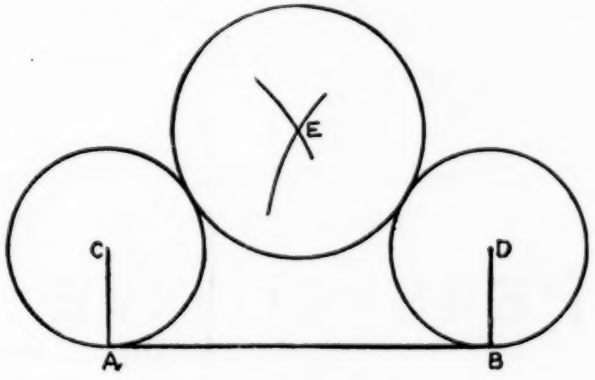
(6) Make the angle AOB 115°, and measure OA.OB. Produce AO, and with centre B and $1\frac{3}{4}$" radius cut the line produced in point C. Make AOD 85°. With centre B and 3" radius cut OD in D.

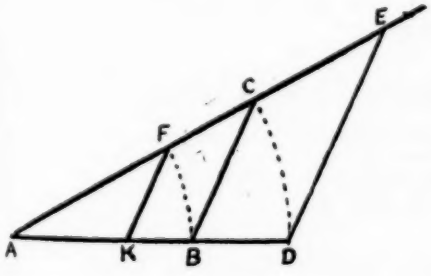
Produce AD, and draw CE parallel to BD. Join EB, and AEB is a triangle equal to the quadrilateral. Bisect AB in K. Draw KF perpendicular to AB, and EF parallel to AB. AFB is an isosceles triangle equal to AEB, and therefore equal to the quadrilateral figure.



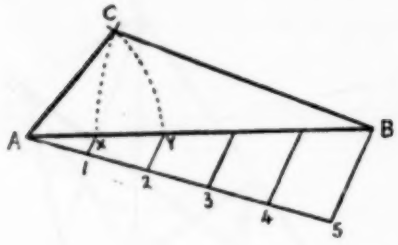
(7) By dividing the semicircle into six equal parts, and joining the points obtained to C, the loci of all the small arcs are obtained. Make AB half an inch, and draw the semicircle AD, a locus for the centres of the several small arcs. Where this locus cuts the other loci the centres of the arcs will be obtained.

(8) Draw AC and BD at right angles to AB, and each $\frac{3}{4}$ inch long. C and D are the centres of the smaller circles. With centres C and D, and a radius of $\frac{3}{4}$" + 1" ($1\frac{3}{4}$"), describe the arcs, cutting at E. E is the centre of the larger circle.



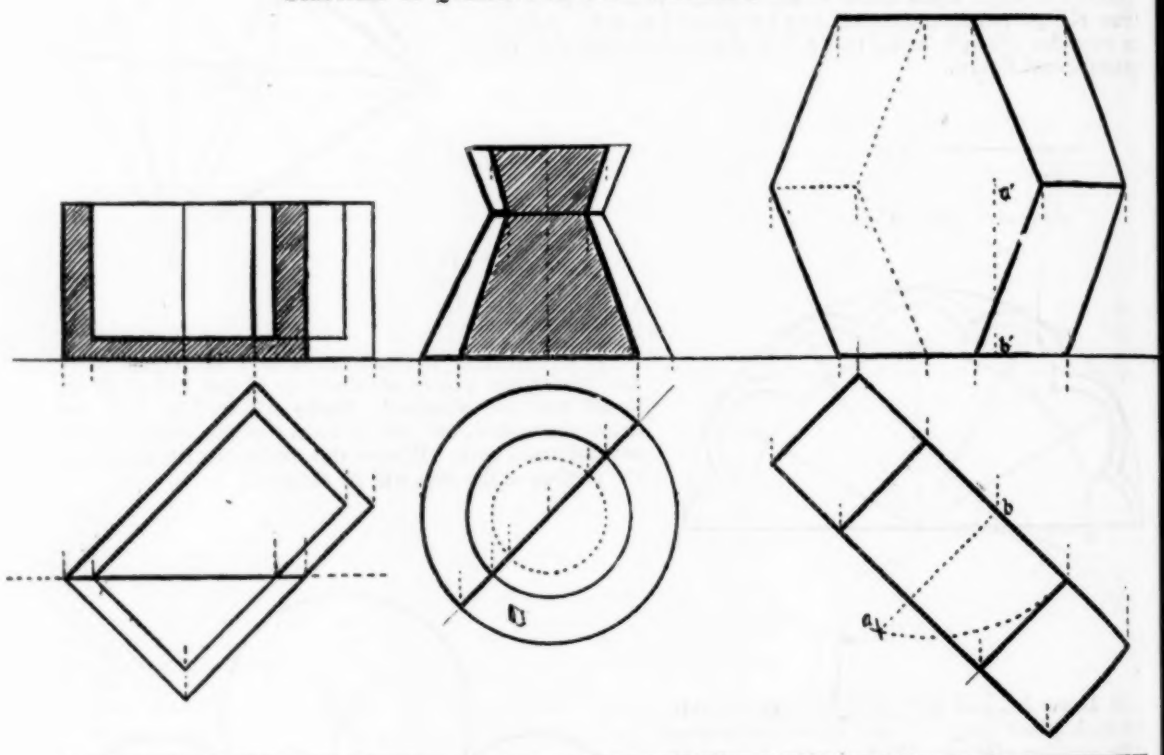


(9) Draw AB $1\frac{1}{2}$ inches long and AC $2\frac{1}{4}$ inches long, making any angle with each other. Produce AB to D, making AD $2\frac{1}{4}$ inches long. Draw DE parallel to BC; then AE is the third proportional greater to AB and AC. $(1\frac{1}{2} : 2\frac{1}{4} :: 2\frac{1}{4} : AE) = (\frac{9}{4} \times \frac{9}{4} \times \frac{4}{9} = AE) = 3\frac{3}{8}$. Make AF = AB, and draw FK parallel to BC; then AK is the third proportional less to AC and AB. $(2\frac{1}{4} : 1\frac{1}{2} :: 1\frac{1}{2} : AK) = (\frac{3}{2} \times \frac{3}{2} \times \frac{4}{9} = AK) = 1$.



(10) Draw AB 2¾ inches long and divide it into 5 equal parts. With centre B and distance BX describe the arc XC. With centre A and distance AY, describe the arc YC. Join AC, BC; then ABC is the triangle required.

SOLUTIONS TO QUESTIONS IN SOLID GEOMETRY, 11, 12, AND 13.



NOW READY. Demy 4to. Price 2/-

PERSPECTIVE PROJECTION,

THE THEORY AND PRACTICE OF.

By **E. G. BAKER, B.A., B.Sc.,** *Vice-Principal of the Training College, Carmarthen.*

Specially designed for Pupil Teachers, Technical Schools, and for the Examinations of the Science and Art Department.

The Teachers' Aid says:—'An excellent introduction to the Perspective Projection. Now that the possession of a "D" Certificate is so important, it behoves all our young professional brethren to strive to obtain it. A persevering use of this work would land them one step nearer their goal.'

The School Board Chronicle says:—'Mr. BAKER, while premising the great advantage of a knowledge of practical geometry to the student of perspective drawing, provides for those who come unprepared to that extent for this study, such instruction in the elementary ideas concerning "lines and planes and their intersections" as are indispensable preliminaries to the study in hand. Then begin the lessons and problems on perspective drawing, projection of parallel lines, projection of vertical lines, application of height lines, projection of curves, &c. The large dimensions and good manipulation of the figures afford great help to the student.'

JOSEPH HUGHES & CO., Froebel House, St. Andrew's Hill, Doctors' Commons, London, E.C.

TEACHERS' DRAWING LESSONS.

MODEL.

STANDARD VI.

BY E. BUFFERY RIDGE,
Art Master under the London School Board.

The Red Terra-cotta Vase.—In this vase the contour is broken up into sections, of which one, being larger and more important than the other, is said to be predominant.

This principal section is the chief thing to be studied, its shape and proportions giving the character to the object.

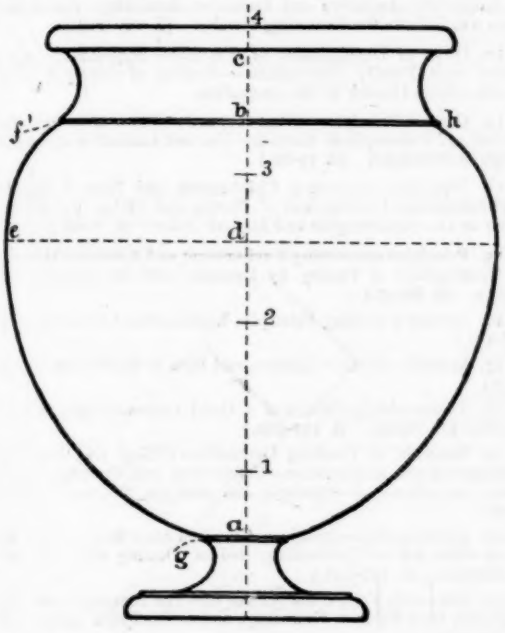


Fig. 1 is an elevation of the vase, to be used as a Freehand copy; it is drawn to one-third scale.

Divide a centre line into four equal parts, and with reference to these divisions fix the positions of *a* and *b*. The length of *ab* is just over two-thirds of the total height, and it is almost exactly equal to the top line through 4. The bottom line is rather more than half the top. Mark *d* between 2 and 3, and draw all the horizontal lines; compare *de* carefully with the centre line—it will be found to be less than half, but more than a third of the height.

The three principal curves, *i.e.*, those of the neck, body, and foot, are separated by very narrow fillets, but this does not alter the necessity of making the lines agree with the principle of tangential junction. Thus, the neck curve being continued outward at *f*, will not cut into the body curve, and this continued inward will not touch the neck curve. Instead of touching they are connected *at the point where they are nearest to each other* by the short upright line of the fillet. The same care must be taken at *g*, where the top of the foot is joined in like manner to the body.

The hollowing of the upper surface of the plate at the foot causes the curve downwards from *g* to be lost behind the horizontal line. This will require special notice in the model drawing.

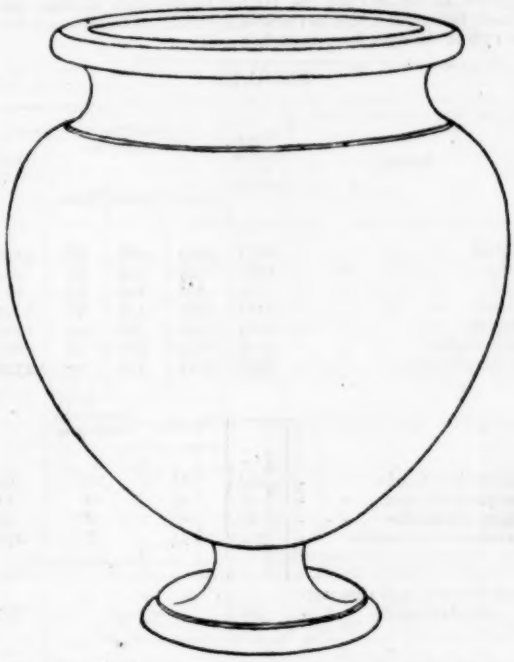


Fig. 2 is a sketch of the vase as seen when placed slightly below the level of the eye. A centre line, with divisions and horizontals as in Fig. 1, should first be drawn, and the horizontal lines used as the major axes of ellipses, the proportions of which become rounder as the eye travels from the top of the figure to the bottom. Note the ellipse in the top showing the opening—the joining of the side curves of the body at the bottom, hiding the fillet—and the side curves of the base losing themselves in the hollowed out foot.

LEGAL AND CODE QUERIES COLUMN.

RULES.

1. All communications must be addressed 'Legal Editor, PRACTICAL TEACHER, Froebel House, St. Andrew's Hill, Doctors' Commons', E.C.,' and must be accompanied by our 'coupon,' duly filled up.
2. Replies will be given *only* in this column, except under the conditions named in Rule 3.
3. If any reader desires a reply by post, such can be forwarded by enclosing, in addition to the coupon, a stamped addressed envelope and either stamps or a Postal Order to the value of one shilling.
4. No original documents should be forwarded, but copies only. We cannot hold ourselves responsible for any losses which occur through non-observance of this rule.

EDUCATION DEPARTMENT—SCOTLAND.

Examination for Leaving Certificates, 1895, in connection with Higher Class Schools and the Higher Departments of State-aided Schools in Scotland, held by the Scotch Education Department from the 17th to the 25th June (inclusive) :—

RESULTS.

Subject.	Total Number presented.	Passed in different grades.			Total passes.
		Lower.	Higher.	Honrs.	
English	8677	3109	1068	58	4235
Latin	1790	645	332	22	999
Greek	865	308	140	15	463
French	4227	1889	423	80	2392
German	1969	990	356	55	1401
Mathematics	3625	1634	401	39	2074
Arithmetic only	8338	3811	725	—	4536
		Passed.	Passed with Distinction.		
Geometrical Conics	124	42	18		60
Analytical Geometry	95	33	18		51
Higher Dynamics	60	28	2		30
Elements of Dynamics	310	143	7		150
Book-keeping and Commercial Arithmetic	516	——			307

——	1888.	1893.	1894.	1895.
Number of Candidates	972	7148	9833	13,173
Number of Schools	29	152	212	270
Number of Papers taken	4300	24,240	30,906	39,966

The Department will at once notify the results to individual schools, and will issue the Certificates in the course of a few days.

H. CRAIK, Secretary.

Scotch Education Department,
Dover House, Whitehall,
17th July, 1895.

OUR 1896 CERTIFICATE CLASS.

BY J. C. HOROBIN, M.A.,
Principal, Cavendish College, Cambridge.

SYLLABUS OF SCHOOL MANAGEMENT.

40 Weeks' Work.

(*The References are to Gladman.*)

FIRST YEAR.

1. Mental Science—The Phenomena of Mind—Knowing, Feeling, and Willing—The Intellectual Faculties. (Glad. part ii. 102–107.)

2. Sensation, Muscular, Organic, Special—The Five Senses—Taste, Smell, Touch, and their Organs. (ii. 108–111, and Table at end.)

3. The Senses—Hearing—The Ear, its Structure and Mode of Action—Impressions Classified—Training of this Sense—Rhythm and Music. (Table at end, Glad.)

4. Sight—The Eye, its Structure and Function—Form and Colour—Training the Eye—Defective Vision. (Table at end.)

5. Sense—Perception and Observation—The Process Analysed—Co-operation of Sight and Touch—Cultivation of the Perceptive Faculty. (Glad. ii. 111–121.)

6. Attention—Stimuli, External and Internal—The two kinds of Attention—Growth of Attention—How to Train the Faculty. (Glad. i. 23–32.)

7. Memory (Reproductive Imagination) Retention and Reproduction, Conditions of—Association. (ii. 128–136.)

8. Kinds of Association, with their Sud-divisions—Growth and Training of Memory—Memory in connection with various subjects of instruction. (ii. 137–153.)

9. Imagination, its place in Teaching—The two kinds, Reproductive and Constructive (Fancy)—Exercise of Imagination in Reading, Geography and other Lessons—Use of Pictures and Objects in Training the Faculty.

10. Conception, including Comparison, Abstraction, and Generalisation—Formation of General Notions—School Exercises which Train the Faculty. (ii. 153–160.)

11. Judgment and Reasoning. Comparison of Concepts—Early and Mature Forms of Judgment—Moral Judgments—Comparison of Judgments—Inductive and Deductive Reasoning—School Subjects which Train the Reasoning Faculty. (ii. 160–168.)

12. Order of Development of Faculties—Approximate Age at which each Faculty Predominates—Bearing of this upon School Work—Brain Growth in this connection.

13. General Principles—What they are and how arrived at—Empirical and Philosophical Methods—Use and Limitation of a Knowledge of Principles. (ii. 75–81.)

14. Principles concerning Child-nature and Natural Methods, and concerning Development of Faculty and Order of Subjects—Bain on the Psychological and Logical Order. (ii. 82–87.)

15. Principles concerning Environment and Educative Influences—Development of Faculty by Exercise—Self-Development—Heredity. (ii. 88–97.)

16. Spencer's Guiding Principles Explained and Illustrated. (ii. 98–101.)

17. Method—Notes of Lessons, and How to Write them. (i. 154–157.)

18. Lesson-giving—Marks of a Good Lesson—Common Faults—How to Criticise. (i. 157–161.)

19. Methods of Teaching Generally—Telling and Eliciting—Illustration and Explanation—Comparison and Contrast—Repetition, Importance of—Synthetic and Analytic Methods. (i. 109–128.)

20. Interrogation—Questions Classified according to their purpose—The Art of Questioning, and of Dealing with Answers—Definition. (i. 137–147.)

21. Education Values, the Science of—The Elementary and Class Subjects, their Value as Knowledge and as Discipline—Their Order of Importance.

22. Special Methods—Reading—The Qualities of Good Reading—The Alphabetical, Phonic, and Look-and-Say Methods of Teaching. (i. 167–180.)

23. Reading—Teaching the Alphabet—How to Conduct a Lesson to Juniors, and to Seniors—Code Regulations concerning Reading and Reading Books. (i. 181–189.)

24. Spelling, Its Difficulty—Methods of Teaching and Testing Spelling—How to Conduct a Dictation Lesson. (i. 191–200.)

25. Writing—Characteristics of Good Handwriting—Methods of Teaching—Mulhauser's—Locke's—Jackson's—Position of a Scholar—Drill, &c, (i. 202–218.)

26. Arithmetic, its Importance—First Notions of Number—Notation—Addition—Subtraction—Concrete Illustration. (i. 219–240.)

27. Multiplication and Division—How to Teach and Explain the Rules. (i. 241–246.)

28. Compound Rules—How to Explain and Teach the Tables—Visible and Tangible Illustrations—Reduction, etc. (i. 247–249.)

29. Practice and the Method of Unity—Method of Procedure in each case.

30. Vulgar Fractions—First Principles—How Presented to the Eye—G.C.M. and L.C.M.—Addition and Subtraction Illustrated. (i. 252, 253.)

31. Vulgar Fractions—Explanation and Illustration of Multiplication and Division, etc. (i. 253–254.)

32. Decimals—Notation—Simple Rules—Recurring Decimals—Reduction to Vulgar Fractions.

33. Proportion, Simple and Compound—Interest, Percentages, etc.

34. Geography—Code Requirements—How to Teach, and Apparatus Required for the Course for Standards I. and II. (i. 260–276.)

35. Grammar—Code Requirements—Alternative Courses—Inductive and Deductive Methods of Teaching—Analysis and Composition. (i. 288–306.)

36. History—Value of—Kind of History to be Taught—Purpose of Teaching History—Code Requirements. (i. 277–289.)

37. Elementary Science, Value of—How to Teach—Continuation of Object Lessons—Courses Suggested in the Code.

38. Drawing, its Value and Importance—Spencer's Views on Teaching Drawing—Course Prescribed by S. and A. Department.

39. Infant Instruction, Principles of—Importance of the Concrete Power of Attention in Infants—Consequent Length of Lessons, and Changes of Employment—Code Requirements for Infant Schools.

40. Fröbel and the Kindergarten—Varied and Appropriate Occupations—Importance of Eye and Hand Training.

Second Year.

1. Logic, Definitions of—How we Commonly Reason. (Jevons', Less. i. and Primer.)

2. The Three Parts of Logic—Terms, Propositions, Syllogisms—The Corresponding Mental Operations. (Less. ii.)

3. The Various Kinds of Terms—Ambiguity of Terms. (Less. iii. and iv.)

4. The Two-fold Meaning of Terms—In Extension and Intension. (Less. v.)

5. The Different Kinds of Propositions—Quality and Quantity of Propositions. (Less. viii.)

6. The Opposition of Propositions—Distribution of Terms—Contrary, Contradictory, and Sub-contrary Propositions. (Less. iv.)

7. Conversion of Propositions and Immediate Inference. (Less. x.)

8. The Predicables—Tree of Porphyry—Division. (Less. xii.)

9. Logical Definition—The Laws of Thought. (Less. xii. and xiv. in part.)

10. The Syllogism—Its rules and Their Application. (Less. xv.)

11. Irregular and Compound Syllogisms. (Less. xviii.)

12. Conditional Arguments—Hypothetic and Disjunctive Syllogisms. (Less. xix.)

13. Logical Fallacies—The Purely Logical—The Semi-logical Fallacies. (Less. xx.)

14. Material Fallacies — Accident — Petidio Principii, etc. (Less. xxi.)

15. Logical Method—Analysis and Synthesis—Induction—Perfect and Imperfect. (Less. xxiv. and xxv. *ex parte.*)

16. Induction and Analogy — Observation and Experiment. (Less. xxvi. and xxvii.)

17. Methods of Induction—Cause and Consequence—Method of Agreement—Of Difference. (Less. xxviii.)

18. Empirical and Deductive Methods—Their Results—Scientific Discoveries. (Less. xxx.)

19. Discipline—Importance—Motives to be Utilised—Aims and Methods. (Glad. pt. i. 37.)

20. Rewards and Punishments. (Glad. i. 70–90.)

21. Formation of Habits and Character.

22. Organisation, Systems of—Staff and Staffing. (Glad. ii. 36–44, and Code.)

23. Classification of Scholars—Importance of—Methods of. (Glad. ii. 36–44, and Code.)

24. Time-tables—Principles Involved—Circumstances Affecting—How to draw up a T.T. (Glad. ii. 45–54.)

25. School Furniture—Construction and Mode of Arrangement. (Glad. ii. 66–74.)

26. Apparatus for Ordinary Subjects—For Object Lessons—Cabinet of Objects.

27. Rooms—Size, Shape, Space per Scholar—Ventilation.

28. Lighting and Warming of School-rooms.

29. Health—Eyesight in School—Infectious Diseases, and Precautions concerning them.

N.B.—The notes and division of the special subject and revision scheme will appear next month.

Syllabus of First Year Music.

20 Weeks' Work.

(*The references are to Curwen's Standard Course.*)

1. Production of Tone and Classification of Voices.

2. Key-tone and Dominant 3—Accent, Pulse, Measure 6—Ear Tests 12—Hand Signs iv.

3. Mediant 4—Chord of Tonic 4—Mental Effects 4—Half Pulses 7.

4. Super-tonic and Leading-note 15—Taa-tai-ing 7—Medium Accent 18.

5. Chord of Dominant 20—Different kinds of Measure 18—Silent Pulses 18.

6. Subdominant and Submediant 26—Quarter Pulses 18—Time Hand Signs v.

7. Chord of Subdominant—Qualifying of Mental Effect 28.

8. Intervals of Scale 48—Standard Pitch 29.

9. Major and Minor Seconds and Thirds 21—Unequal Divisions of a Pulse 34—Pointing from Memory 12.

10. Writing Notation very Boldly and Legibly—Summary of Steps 1, 2, 3.

11. Fourth Step—Transition by Imperfect Method 49—Ear Tests in Transition.

12. Inversion of Seconds and Thirds 21—Pitching Tunes 29—The Metronome 33.

13. Intervals of Fourths and Fifths perfect, etc., 21—Moving of Doh, and New Tone—Musical Terms 163, 164.

14. Inversion of all Intervals—Transition by better or Perfect Method 50.

15. Doubling or Halving Time Values—Cadence or Passing Transition 52.

16. Intermediate Rhythms—Signature of Transition by Key-name, New Tone, and Bridge-note 51.

17. Six Pulse Measure 24—Adaptation of Sol Fa to Standard Pitch 49.

18. Beating time 86—Musical Terms 165, 166.

19. Changing Major Intervals into Minor, and vice-versâ—Writing Exercises for Code.

20. Writing tunes from Memory 24—Musical Expression 30.

Syllabus of Second Year Music.

20 Weeks' Work.

1. Training College Music Tests for Practical Exam.—The Modes 84—Fifth Step.

2. Voice Production 1, 2—Modern Minor Mode 86.

3. Compass of S. A. T. and B. Voices 29—The three forms of the Minor or Lah Mode.

4. Tonic, Dominant, Leading-note, etc., of the Minor Mode 86. First Step of Staff Notation.

5. Changing Minor Intervals into Diminished—Beating Time 86. Syncopation 34.

6. Shorter Compass of Children's Voices—Rare Accidentals 88. Second Step O. N.

7. Changing Major Intervals into Augmented—Third Step O. N.

8. Fah and Se essential 6th and 7th of Minor Mode as in second form—Signature of Transition 51.

9. Changing Major Passages into Minor, and vice-versâ.

10. Causes and Remedies for Flattening 109—Time in O. N.

11. Transition of Two Removes 117—Registers of Voice 107.

12. Changing Passages from Imperfect to Perfect Method, and vice-versâ.

13. Cultivation of Upper Register of Boy's Voice downwards from E or F 107—Transition in O. N.

14. Elementary Harmony 26—Writing Exercises for Code.

15. Change of Interval with Change of Name Invariable; Thus, f la—f se.

16. Writing Tunes from Memory—Keys in O. N.

17. Transposition in O. N.

18. Musical Expression 130, and Musical Form 69, as time may permit.

19. Points for Marks in a Choir-singing Competition.

20. General Summary of School Music Teaching.

Syllabus of Physical Geography.

20 Weeks' Work.

(*The references are to Gregory.*)

1. Shape of the Earth—Proofs of its Rotundity—Exact Shape—How Ascertained. Size of the Earth—How Ascertained.

2. Methods of Measuring One Degree of Arc of Meridian, and of finding the Latitude of a place. [Greg. Ch. ii.]

3. Motions of the Earth—[1]—Rotation—The Facts—Proofs—Results—Day and Night—Solar and Siderial Day—Longitude and Time. [Ch. iii.]

4. Motions—[2]—Revolution—Time Occupied—Shape of Orbit—Varying Speed—Proofs of Revolution.

5. Effects—Seasons—Length of Day and Night in different Latitudes. [Ch. iv.]

6. Motions—[3]—Through Space with System—Speed—Direction—[4] Precession, sufficiently to explain Solar Year. [Ch. iv. in part.]

7. The Atmosphere—Its Weight—Composition—Height—Twilight—The Barometer. Water-vapour—Evaporation and Condensation.

8. Mist—Cloud—Dew—Rain—Rainfall, how measured—Regions of Excessive and Scanty Rainfall, and the Causes thereof. [Ch. ix.]

9. Movements of the Atmosphere and their Causes—Constant—Periodical and Variable Winds—Cyclones and Anti-Cyclones. [Ch. x.]

10. Movements of the Oceans—Currents and Theories to Account for them.

11. The Chief Ocean Currents—Their Temperature—Direction Effects. [Ch. xv.]

12. Tides, Phenomena of—Theories Concerning them—Why Moon the Chief Agent.

13. Periodical Inequalities and their Causes—Course of the Tidal Wave. [Ch. viii.]

14. Climate, what it is—Circumstances which Affect it—Examples of Equable and Extreme Climates—Isothermal Lines. [Ch. xvi.]

15. Effect of Climate on Industry, Productions, and National Character—Examples of each Effect.

16. Distribution of Plants—Theories Concerning Barriers to Migration—Zones of Vegetation.

17. Floras of Continental and Oceanic Islands, and their Teachings.

18. Characteristic Plants of the Different Continents. [Ch. xvii.]

19. Distribution of Animals—Migration and Barriers to it—Zoological Provinces—Representative Species.

20. Geological Changes—Characteristic Animals of the Various Continents. [Ch. xvii.]

Notes on Macbeth.

The Clarendon Press edition is one of the best for correct text. The notes are too detailed for pure literature purposes, those in the editions of Macmillan and Moffat being better suited to the Certificate standard. But having regard to the possible questions on text, I should advise the Clarendon Press and Macmillan's edition by Deighton. Mr. Ransom gives a good summary.

Act I. of the Play (Macmillan).

Scene I. shows the supernatural as the motive force, and Macbeth as impelled thereby.

Scene II. shows the condition of Scotland.
- (*a*) A weak, pusillanimous King.
- (*b*) Macdonwald's insurrection.
- (*c*) Cawdor's treachery.
- (*d*) Norwegian invasion.

Scene III. gives the witches' prophecy, immediately followed by the salutation of Macbeth by the King's messengers as 'Thane of Cawdor,' which impels Macbeth to question Banquo as to the possibility of the truth of the witches' prophecy. Macbeth sees the only way is through murder, and he hesitates. 'If chance will have me King, why, chance may crown me, without my stir.'

Scene IV. represents Duncan as helpless as a child in the distracted country.

The anti-climax which followed the King's expression to Macbeth—

'More is thy due than more than all can pay,'

in his naming Malcolm Prince of Cumberland, a title which carried with it the succession, seems to have been the proximate cause of Macbeth's action.

Scene V.—Lady Macbeth receives Macbeth's letter, giving an account of the interview with the witches, and shows that he fully believed the promise in their address. The scene gives also a view of Macbeth's character through the intuition of the woman.

In the passage beginning 'Glamis thou art,' etc., the whole meaning turns on the signification of the word 'kindness.' In Shakespeare's time 'kindly' meant natural, and Lady Macbeth seems to read quite clearly the inherent weakness of her husband, in that he desires that which he is too feeble to grasp. Crime he does not revolt at as such, but he fears consequences, and cannot 'screw his courage to the sticking-place.'

The entry of the King's messenger announcing the visit of Duncan and the ensuing conversation of husband and wife shows that they are one in ambition, but that the unscrupulousness of the woman makes her the abler plotter.

Scenes VI. and VII.—The picture of the external appearance of Macbeth's castle is a horrible adornment to the death trap which it is to the guileless Duncan, and Shakespeare's art is at its best in the womanly wife of the rude warrior, whilst showing that in the moral world hers is the stronger nature. Then comes the wonderful painting of the irresolution and vacillation of Macbeth, who is stirred by the chances of failure to withdrawal from the plot, but who is not strong enough to tell his wife the real reason. She sees through his excuse and taunts him with cowardice, and by this means rouses the warrior at the expense of the man.

Act II.

Scene I.—Macbeth sounds Banquo, but finds him faithful, and then, like a true Highlander, he creates for himself objective portents out of subjective conditions.

Scene II.—Here the difference of nature in the man and the woman comes out fully. She dare not strike the blow because of a resemblance in the King to her father. He does not hesitate at that, but, the deed done, is unnerved and full of superstitious terror, whilst she returns to the room to replace the dagger which Macbeth had carried away in his fright.

Scene III.—In meeting Macduff the real strength of Macbeth comes out, and he avails himself of every point to cover the doers of the ghastly crime. Macduff and Lennox are quite taken in, and Lady Macbeth by her fainting attracts attention to herself.

Macbeth might, in relation to the prophecy, have adopted one of three methods of conduct.

(*a*) Take active steps to hasten the fulfilment.
(*b*) Adopt an attitude of indifference.
(*c*) Exert himself to avert his destiny.

In Acts I. and II. Macbeth's attitude was clearly to aid in fulfilling the prophecy.

Between Act II. and Act III. some interval of time is supposed to elapse, and the centre of interest in the opening scene of Act III. is clearly Banquo. He holds in his hands all the threads connecting Macbeth with the murder of Duncan, and besides, is superstitious enough to put some faith in the prophecy so far as it related to himself.

Macbeth shows his recognition of the position of Banquo in the soliloquy: 'To be thus is nothing,' etc.

Macbeth is illogical, and attempts to procure the fulfilment of the first part of the prophecy whilst preventing the latter part. Hence is fear for the present and envy for the future in Banquo.

Act III.

Scene II. shows Lady Macbeth's moral strength as compared with her husband's.

Scene III. is the turning point in Macbeth's luck, and his misfortunes begin in:

'Banquo is down, Fleance fled.'

Scene IV. is the banquet scene, and is remarkable for the fact that whilst in Hamlet the ghost is supposed visible to many, in this case it is only visible to Macbeth, and there is the wonderful study of a man conquering at intervals his superstitious terror and then driven to frenzy by the apparition.

There is a doubt as to the authenticity of Scene V., but supposing it Shakespeare's work it is appropriate enough as showing the witches' queen contriving ruin for the mere mortal who sets himself against the weird sisters.

Scene VI. gives the first intimation of suspicion of Macbeth in the conversation between Lennox and a lord.

Act IV.

Scene I. and II. is the beginning of the end. Macbeth is goaded to fury and infinite cruelty by the witches in his second visit, whilst Macduff finds himself almost checkmated by the suspicion of Malcolm. The alternate self-damnation and expression of determination to win his own of Malcolm thoroughly unmans Macduff, and Shakespeare introduces Scene III., which enables him to pay a compliment to James I. and give Macduff time to recover.

Act V.

Scene I. shows the nature of the courage of Lady Macbeth. It was in endurance to help her husband, but now the matter is one for purely physical courage she gives way, and she dies, probably by her own hand.

In the final scene Macbeth rises to the necessities of the times. The death of his wife leaves him as calm as Brutus, and he glories in the battle, dying a true soldier.

Acquiescing in the supernatural, he is feeble; defying it, he is strong though unwise.

Prof. Dowden says: 'The theme of the drama is the gradual ruin, through yielding to evil within and evil without, of a man who, though from the first tainted by base and ambitious thoughts, yet possessed elements in his nature of possible honour and loyalty.'

Walters says: 'In Macbeth we have a terrible story of sin and its consequences, we mark the downward career of two souls into moral dissipation and ruin.'

Lady Macbeth seems to be a veritable incarnation of pride, cruelty, self-will, and brutal firmness. She would dash the brains out of her own babe if necessity so required. She is cool and confident to a degree, ready to avail herself of every power of earth, heaven, or hell, to obtain her end.

She has a woman's weakness in physical courage, but a good example of strength of will and resolve.

Coleridge says:—'Hers is the mock fortitude of a mind deluded by ambition; she shames her husband by a superhuman audacity of fancy which she cannot support, but sinks in the season of remorse, and dies in suicidal agony.'

Dr. Johnson considered her as a kind of ogress, and says:—'Lady Macbeth is merely detested.'

Schlegel dismisses her as a species of female fury.

Mrs. Jamieson says:—'Ambition is represented as the ruling motive, an intense overmastering passion, which is gratified at the expense of every just and generous principle, and every feminine feeling. In the pursuit of her object, she is cruel, treacherous, and daring.'

'She appears the more active agent of the two; but it is less through her pre-eminence in wickedness than through her superiority of intellect.'

Lady Macbeth had a lofty determination, and this and her eloquence profoundly moved her husband (I. vii. 3 and 58).

She is cool and confident, but womanly (I. v. 69, vii. 59) (II. ii. 12).

Coleridge says: 'Hers is the mock fortitude of a mind deluded by ambition; she shames her husband by a superhuman audacity of fancy which she cannot support, but sinks in the season of remorse, and dies in suicidal agony.'

Macbeth is brave (I. ii. 6–19, 54), ambitious (I. v. 17, vii. 7), unpolished (I. iii. 142, vii. 28, viii. 8), not wicked by nature (I. v. 15–20), infirm of purpose (I. iii. 138, II. iii. 72 and 76).

Banquo is the antithesis of Macbeth. His self-reliance, purity, and integrity are clearly manifest (I. iii. 52) (III. i. 49). A brave warrior, loyal subject, and faithful though sluggish friend (II. i. 8).

Duncan is amiably weak (I. iv. 12, vii. 16).

Malcolm is self-governed, suspicious, but patient and prudent (II. iii. 117, IV. iii., V. iv. 4).

Macduff is noble, wise, clear-sighted, prudent, and utterly unselfish (IV. ii. 1, iii. 26, IV. iii. 35).

Gervinus says of the witches:—'They are common in speech, ignoble, half-human creatures, ugly as the evil one, and in like manner old and of neither sex; they are the embodiment of inward temptation.'

The play might be divided and described under the following heads:—

(*a*) The suggestion of sin.
(*b*) The agents of suggestion.
(*c*) The sin.
(*d*) The punishment of sin.

REPLIES.

Messrs. Macmillan have published a concise Geography of the British Colonies, which is the special Geography subject, and Messrs. Gill have one in the press revised to date.

Hall and Knight, p. 207, No. 10.

N.B.—If mA is the present value of an annuity A, the annuity is said to be worth m years' purchase.

$$\therefore 25\,A = A\,\frac{1 - R^{-n}}{R - 1}. \quad (1)$$

$$30\,A = A\,\frac{1 - R^{-2n}}{R - 1}. \quad (2)$$

Dividing 2 by 1

$$\frac{6}{5} = 1 + R^{-n}.$$

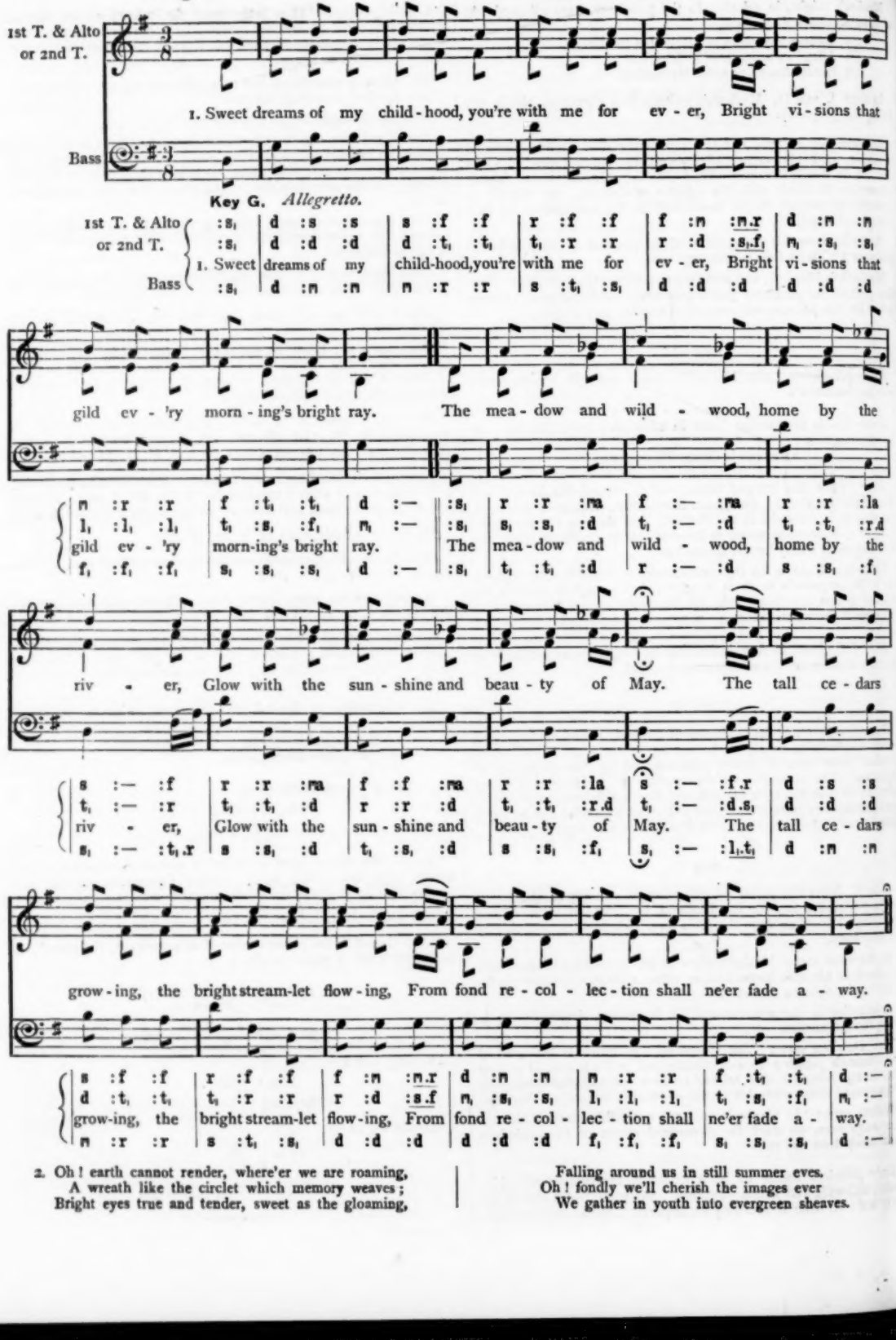
$$\therefore R^{-n} = \tfrac{1}{5}.$$

Substituting in (1)

$$25 = \frac{1 - \frac{1}{5}}{R - 1}.$$

$\therefore$ rate per cent. is $\frac{400}{125}$, or $3\frac{1}{5}$.

DREAMS OF CHILDHOOD.

Allegretto. GERMAN VOLKSLIEDER. Adapted and arranged.

1st T. & Alto or 2nd T.
Bass
1. Sweet dreams of my child-hood, you're with me for ev-er, Bright vi-sions that
Key G. Allegretto.
gild ev-'ry morn-ing's bright ray. The mea-dow and wild-wood, home by the
riv-er, Glow with the sun-shine and beau-ty of May. The tall ce-dars
grow-ing, the bright stream-let flow-ing, From fond re-col-lec-tion shall ne'er fade a-way.

2. Oh! earth cannot render, where'er we are roaming,
A wreath like the circlet which memory weaves;
Bright eyes true and tender, sweet as the gloaming,
Falling around us in still summer eves.
Oh! fondly we'll cherish the images ever
We gather in youth into evergreen sheaves.

Our Science Section.

SOLUTIONS TO QUESTIONS IN THEORETICAL MECHANICS, MAY, 1895.

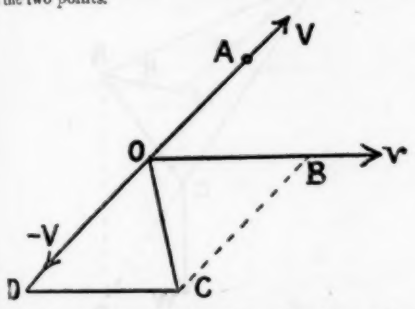
SOLIDS—ADVANCED STAGE.

BY F. CASTLE, M.I.M.E.

(*Continued from July issue.*)

21. A point (A) is moving with a given velocity (V) along a given line; another point (B) is moving with a given velocity (v) along a given line intersecting the former. Show how to find the relative velocity of B to A. (15.)

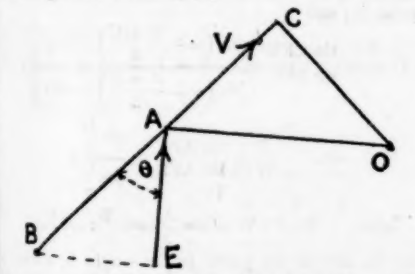
Let O be the point of intersection of the given lines; then if the motion of the moving point B be regarded from the position of point A, it will appear to move with a velocity different from either V or v; this velocity is called the relative velocity of the two points.



To find the magnitude and the direction of the relative velocity, imagine impressed upon each moving point in composition with its own motion a velocity equal and opposite to that of A. This will reduce A to 'rest,' and give to B a velocity $-V$ in addition to its own. Hence make $OD = V$, and $OB = v$; complete the parallelogram ODCB. Then OC represents the relative velocity in direction and magnitude.

22. (*a*) A point moves along a line; find its angular velocity with respect to an assigned point outside the line.

(*b*) Given the line and the fixed point, and that the movable point has a constant velocity along the line, find the position of the movable point when its angular velocity about the fixed point is greatest; find also its position, when its angular velocity is one-fourth of that greatest value. (20.)



(*a*) Let A be the point moving along the line BC with a velocity V. Also let O be the assigned point, and ω the angular velocity of point A. Join A to O and draw AE perpendicular to AO, and OC perpendicular to BC. If the angle BAE be denoted by θ, then $AOC = \theta$. Let AB, to any convenient scale, represent the velocity V, then AE (the resolved part of AB along AE) will equal $V \cos \theta$.

From the known relation $\omega = \frac{\text{velocity}}{\text{radius}}$, we obtain for the instant considered

$$\omega = \frac{AE}{AO} = \frac{\frac{V \cos \theta}{p}}{\cos \theta} = \frac{V \cos^2 \theta}{p}. \quad (1)$$

(*b*) The angular velocity will be a maximum when eq. (1) is a maximum, or when $\theta = 0°$;

$$\therefore \text{ when } \omega = \frac{V}{p};$$

hence the angular velocity is a maximum when the moving point is at C.

To find the position of the moving point when its angular velocity is one-fourth of the greatest value, we have,

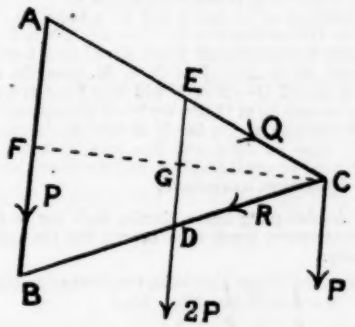
$$\frac{\omega}{4} = \frac{V}{p} \cos^2 \theta;$$

$$\text{or } \cos^2 \theta = \tfrac{1}{4};$$

$$\therefore \cos \theta = \tfrac{1}{2};$$

$$\text{hence } \theta = 60°.$$

23. Draw a triangle ABC, and take D and E, the middle points of BC and CA respectively; if forces P, Q, R act from A to B, A to C, and C to B respectively, and are proportional to the lengths of the sides along which they act; show that their resultant acts from E to D, and is equal to 2P. (20.)



As the force Q is proportional to AC, and acts from A to C, also R is proportional to and acts along CB, the resultant of Q and R will be a force P at C, proportional and parallel to AB.

Hence the three given forces are equivalent to a force P at C, and a parallel and equal force along AB.

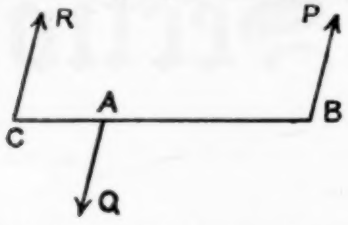
If E and D, the middle points of AC and CB, be joined by the line ED, then from the similar triangles CDE and CBA, the line ED is parallel to AB. Also if F, the middle point of AB, be joined to C, the resultant of the two like parallel forces at F and C will be 2P along ED.

24. (*a*) Define the centre of two parallel forces, and find its position in the case of two unlike parallel forces acting at given points.

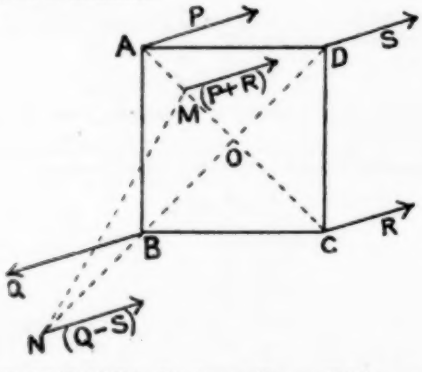
(*b*) A, B, C, D in order are the angular points of a square; unlike parallel forces P and Q act at A and B. Find the parallel forces that must act at C and D, if the centre of the four forces is at the middle point of the square, and show that the problem can be solved in only one way. (25.)

(*a*) If a system of two parallel forces act on a rigid body, the centre is the point at which the resultant of the system may be supposed to act, the position of the point being unaltered whatever be the directions of the parallel forces.

Let P and Q be the two given parallel forces acting a points A and B. If Q be greater than P, the resultant R is a



force of which its magnitude is equal to Q — P, its direction parallel to P and Q, and its point of application C in BA produced so that R × AC = P × AB. From this equation AC can be determined.



(*b*) Let P and Q be the given unlike parallel forces acting at A and B respectively.

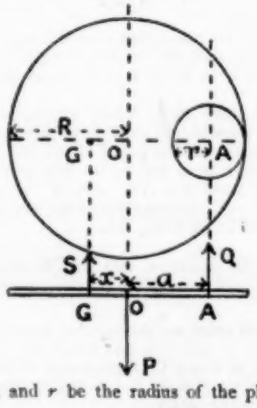
Apply a force S at D and a force R at C.

The resultant of Q and S will be a force Q — S at some point N in DB produced so that Q — S × BN = S × BD.

Similarly the resultant of P and R will be a force P + R at some point M in AC. Join N to M, then the resultant of P + R at M and Q — S at N will be a force at some point in NM, and cannot be at O (the centre of the square) unless both M and N coincide at O; but if M and N do coincide at O, S and Q must be equal and like parallel forces. Similarly R and P must be equal and like, and therefore the direction of S in the figure must be reversed.

25. (*a*) A circular plate has a circular hole cut in it, such that the two circumferences touch each other; find the position of the centre of gravity.

(*b*) Show that the larger the hole, the further is the centre of gravity from the centre of the plate. (20.)



(*a*) Let R and r be the radius of the plate and the hole respectively.

If the plate be assumed to be of unit thickness, and ω be the weight of unit volume of the material,

Then P the weight of the plate before perforation

$$= \pi R^2 \times \omega;$$

Q the weight of the portion cut out $= \pi r^2 \times \omega$; then S the weight after the perforation will be $\pi (R^2 - r^2)\,\omega$.

P and Q may be taken to be two unlike parallel forces, the resultant S being equal to P — Q, and acting as G in AO produced (where A is the centre of the hole and O the centre of the plate).

Let x = GO, and a = AO;

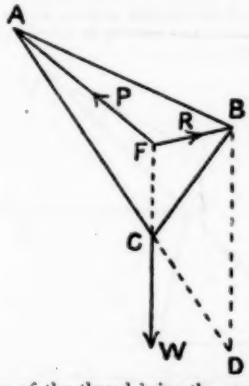
$$S \times a = Q \times a = \pi r^2 \times a \times \omega;$$

$$\therefore x = \frac{\pi r^2 \times a \times \omega}{\pi (R^2 - r^2) \times \omega}$$

$$= \frac{r^2 \times a}{R^2 - r^2}. \quad (1)$$

(*b*) From eq. (1) it is easily seen that if R remains constant and r is increased, the denominator of the fraction is diminished and the numerator increased. Therefore x, the distance from the centre of the plate to the centre of gravity, is increased.

26. A and B are two fixed points not in the same horizontal line the two ends of a thread of given lengths are tied together, and the thread is hung on to A and B; if a weight is hung by a smooth hook from the thread, so as to draw the thread into the form of a triangle ABC, show how to construct the triangle, and prove that the pressures on the fixed points and the weight are in the same ratio as $\cos\frac{A}{2}$, $\cos\frac{B}{2}$, and $\cos\frac{C}{2}$. (30.)



The tension of the thread being the same throughout, the weight W will take up such a position that the angle BC between the two parts of the thread will be bisected by a vertical line passing through C.

If A and B be the given points, l the length of the thread, draw a vertical line BD and with centre A, radius l, describe an arc cutting BD at D, join A to D, and at B make the angle DBC = ADB, then ACB is the triangle required.

The angle CBD being equal to CDB, the side CB = CD, hence AC + CB is equal to l.

Let R denote the pressure on the fixed point B, and P the pressure on A, the resultant of the tensions in the threads BA and BC would be a force bisecting the angle ABC, and the pressure on B is a force equal and opposite to the resultant and shown by R. In a similar manner P denotes the pressure on point A; and

$$\therefore \frac{P}{W} = \frac{\sin CFB}{\sin AFB} = \frac{\sin\left(\pi - \frac{B+C}{2}\right)}{\sin\left(\pi - \frac{A+B}{2}\right)} = \frac{\cos\frac{A}{2}}{\cos\frac{C}{2}};$$

$$\text{also} \quad \frac{R}{W} = \frac{\sin AFC}{\sin AFB} = \frac{\cos\frac{B}{2}}{\cos\frac{C}{2}};$$

$$\text{hence} \quad P : R : W = \cos\frac{A}{2} : \cos\frac{B}{2} : \cos\frac{C}{2}$$

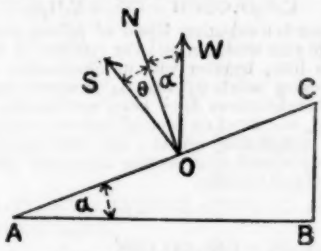
27. Find the ratio of the power to the weight in a screw press taking into account the friction of the thread of the screw. (20.)

The triangle ABC shows one convolution of the screw thread unrolled, BC being the pitch of the screw, and AB the circumference of the screw thread $= 2\pi r$, where r is the radius of the screw thread.

Let W denote the weight raised.

P the force applied at the end of a lever of length a, θ the angle of repose, and

S the reaction of the screw making an angle θ with the normal ON. If the angle BAC = α,



Then the vertical component of S is $= S\cos(\alpha+\theta)$, (1)

And the horizontal component of $S = S\sin(\alpha+\theta)$, denoting the horizontal component of S by F, the vertical component being W.

Then for equilibrium, the reaction S and the force P must have equal moments about the axis of the screw; this gives

$$P \times a = F \times r = S\sin(\alpha+\theta)r; \quad (2)$$

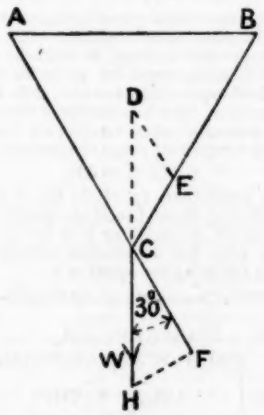
and dividing eq. (2) by eq. (1),

$$\frac{P \times a}{W} = \frac{S \times r\sin(\alpha+\theta)}{S\cos(\alpha+\theta)},$$

$$\text{or } P \times a = W\tan(\alpha+\theta)r;$$

$$\therefore \frac{P}{W} = \frac{\tan(\alpha+\theta)r}{a}.$$

28. Draw ABC, an equilateral triangle, with the base AB horizontal, and C downwards; let a weight at C be tied by threads AC, BC to fixed points at A and B; if the thread BC is cut, show that the tension of AC is suddenly increased by one-half. (25.)



Let T_1 be the tension in AC before the thread BC is cut, and T_2 the tension in AC after the thread is cut.

Construction.—Make CD = W, draw DE parallel to AC; then CE = ED = T_1.

To obtain T_2 make CH = W; draw HF perpendicular to AC meeting AC produced at F; then CF = T_2, and T_2 will be found to be $\frac{3}{2}$ T_1.

From the triangle DCE

$$\frac{T_1}{W} = \frac{\sin 30°}{\sin 120°};$$

$$\therefore T_1 = \frac{W \times \sqrt{3}}{3}.$$

From the triangle HCF

$$\frac{T_2}{W} = \frac{\sin 60°}{\sin 90°};$$

$$\therefore T_2 = \frac{W \times \sqrt{3}}{2};$$

$$\text{hence } \frac{T_2}{T_1} = \frac{3}{2}.$$

When the thread BC is cut, AC remaining invariable in length, the weight will begin to move at right angles to AC. The resolved part of the tension in BC along AC must be the increase of tension in AC, because the force acting at C to balance the tension in CB acts on thread AC when BC is cut.

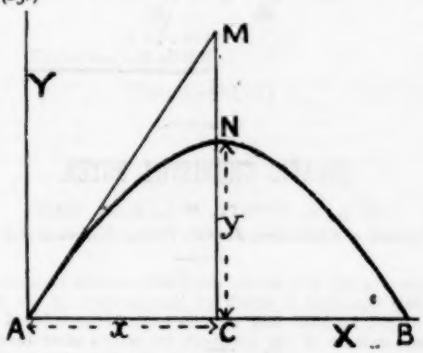
$$\therefore T_2 = T_1 + T_1\cos 60°$$

$$= T_1(1+\cos 60°)$$

$$= \tfrac{3}{2}T_1,$$

hence the tension is increased by one-half.

29. Given V the velocity of projection of a projectile, and v its velocity at its highest point; find the position of the highest point. (25.)



Let the projectile be projected from A with initial velocity V, and in a direction AM, making an angle θ with the horizon.

Let ANB be the path, N the highest point, B the point where the path again meets the horizontal plane through A.

The vertical and horizontal components of the initial velocity of the projectile are V sin θ and V cos θ respectively.

In the vertical direction the acceleration is $-g$. Hence in a time t the height of the projectile would be given by

$$V\sin\theta \times t - \tfrac{1}{2}gt^2. \quad (1)$$

The vertical velocity at the end of time t is

$$V\sin\theta - gt. \quad (2)$$

At the instant the projectile reaches the highest point N, the vertical velocity is zero;

$$\text{therefore } V\sin\theta - gt = 0;$$

$$\therefore t = \frac{V\sin\theta}{g}. \quad (3)$$

Substituting the value of t from eq. (3) in eq. (1), and

$$CN = \frac{V^2\sin^2\theta}{2g}.$$

The time taken from A to C is $\frac{V\sin\theta}{g}$;

$$\text{hence } AC = \frac{V\sin\theta}{g} \times V\cos\theta, \text{ but } V\cos\theta = v;$$

$$\therefore AC = \frac{V\sin\theta \times v}{g};$$

or if x and y are the co-ordinates of the highest point, then

$$x = \frac{V\sin\theta \times v}{g},$$

$$y = \frac{V^2\sin^2\theta}{2g}.$$

30. A bullet, moving at the rate of 1,100 feet a second, passes through a thin plank and comes out with a velocity of 1,000 feet a second; if it then passes through another plank exactly like the former, with what velocity will it come out of this second plank? (25.)

Let W = the weight of the bullet.

The initial kinetic energy

$$= \frac{W \times (1100)^2}{2g} = \frac{1{,}210{,}000 \times W}{2g}.$$

The loss of kinetic energy in passing through one plank

$$= \frac{W(1100^2 - 1000^2)}{2g}$$

$$= \frac{210{,}000 \times W}{2g}.$$

Hence assuming that the same amount of work is done in overcoming the resistance of each plank, the loss of energy would be

$$= \frac{420{,}000 \times W}{2g};$$

and if V denote the final velocity of the bullet, then, initial energy — loss of energy = final energy;

$$\text{or} \quad \frac{1{,}210{,}000 \times W}{2g} - \frac{420{,}000 \times W}{2g} = \frac{W \times V^2}{2g};$$

$$\text{or} \quad \frac{WV^2}{2g} = \frac{790{,}000 \times W}{2g};$$

$$\therefore V = 100\sqrt{79}$$

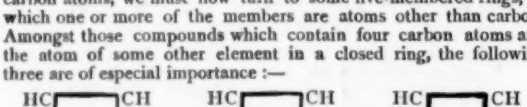
$$= 888{\cdot}89 \text{ feet per second.}$$

(To be continued.)

ORGANIC CHEMISTRY NOTES.

BY J. T. HEWITT, M.A., D.SC., PH.D.,
Professor of Chemistry, People's Palace Technical Schools.

HAVING in the last article dealt with various compounds of a closed-ring character, in which all the members of the ring were carbon atoms, we must now turn to some five-membered rings, in which one or more of the members are atoms other than carbon. Amongst those compounds which contain four carbon atoms and the atom of some other element in a closed ring, the following three are of especial importance :—

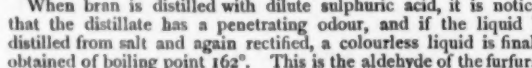


Furfuran. Thiophene. Pyrrol.

These substances show a certain resemblance to benzene, which is especially marked in the case of thiophene. We shall first of all take the derivatives of the oxygen compound, and show how the nucleus furfuran may be obtained.

When bran is distilled with dilute sulphuric acid, it is noticed that the distillate has a penetrating odour, and if the liquid be distilled from salt and again rectified, a colourless liquid is finally obtained of boiling point 162°. This is the aldehyde of the furfuran series, $C_4H_3O.CHO$, more generally known by the name of furfurol. Not only has furfuraldehyde been obtained in this manner from bran, but from a large number of carbohydrates in greater or less quantities, but it is chiefly from the pentoses—arabinose and xylose—that a furfuraldehyde distillate is obtained. B. Tollens has proposed distillation of vegetable products with dilute acid and estimation of the furfurol in the distillate to ascertain the percentage of pentose present; the furfurol may be weighed as furfuralphenylhydrazone, $C_4H_3O.CH : N.NH.C_6H_5$.

We have given furfurol the formula of an aldehyde; it shows the reactions of such a compound, reducing silver oxide, forming pyromucic acid.



It may be reduced by sodium amalgam to the corresponding alcohol, $C_4H_3O.CH_2OH$, and shows the other general reactions of aldehydic compounds, combining with hydrazines, acid sodium sulphite, etc. It shows, perhaps, more analogy to aromatic than to fatty aldehydes, as by alcoholic potash it is decomposed into pyromucic acid and furfuryl alcohol instead of becoming resinous,

$$2C_4H_3.CHO + KOH = C_4H_3O.COOK + C_4H_3O.CH_2OH.$$

The reaction is analogous to Cannizzaro's reaction of potash on benzaldehyde. Again, if furfuraldehyde is boiled with water, alcohol, and potassium cyanide, it polymerises, giving furoïn,

$$C_4H_3O.CO.CHOH.C_4H_3O,$$

which may be oxidised to the compound furil,

$$C_4H_3O.CO.CO.C_4H_3O.$$

(Compare benzoïn and benzil.)

Pyromucic acid may be obtained not only by oxidation of furfuraldehyde, but also, as its name implies, by distillation of mucic acid

$$(CHOH)_4(COOH)_2 = CO_2 + 3H_2O + C_4H_3O.COOH.$$

When pyromucic acid is heated with caustic soda it loses carbon dioxide, and gives the nucleus furfuran,

$$C_4H_3O.COOH = CO_2 + C_4H_4O.$$

This substance is a colourless liquid of boiling point 32°, which is also found in pine wood tar, and the products of the distillation of sugar with lime, together with its monomethyl and dimethyl derivatives (boiling points 63° and 94° respectively). Dimethyl- and methylphenyl-furfuran have been synthetically prepared by Paal and Tafel, who acted on acetonyl-acetone and acetonyl acetophenone with dehydrating agents. The two diketones here mentioned may be prepared from sodium acetoacetic ether and brom acetone or phenacyl bromide.

(i.) $CH_3.CO.CHNa.COOC_2H_5 + CH_3.CO.CH_2Br$

$$= NaBr + CH_3.CO.CH\begin{cases}CH_2.CO.CH_3\\COOC_2H_5\end{cases}$$

(ii.) $CH_3.CO.CHNa.COOC_2H_5 + C_6H_5.CO.CH_2Br$

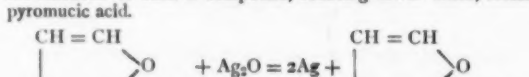
$$= NaBr + CH_3.CO.CH\begin{cases}CH_2.CO.C_6H_5\\COOC_2H_5\end{cases}$$

These two ethers may be hydrolysed, and the resulting acids converted into diketones, *e.g.* :—

$$CH_3.CO.CH\begin{cases}CH_2.COCH_3\\COOH\end{cases} = CO_2$$

$$+ CH_3.CO.CH_2.CH_2.CO.CH_3.$$

When acetonyl acetone loses water, it is probable that the compound reacts as if it had a tantomeric alcohol formula; the reaction can be expressed by the equation—



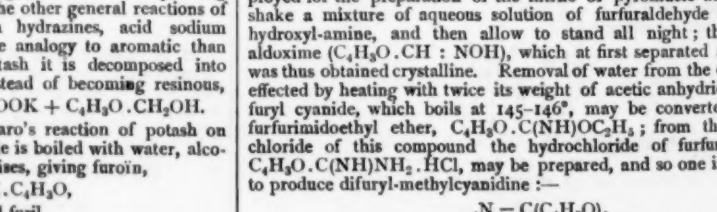
whilst a similar equation would serve for the conversion of acetonyl acetophenone into methyl phenyl furfuran.

Harrow's 'carbopyrotritaric ether,' to which he assigned an incorrect constitutional formula, turned out to be the diethyl ether of dimethylfurfuran dicarboxylic acid (*Annalen*, 201. 152).

When diacetylsuccinic ether is boiled for a short time with dilute sulphuric acid, a monoethyl ether results; on boiling for a longer space, hydrolysis is completed, and a dicarboxylic acid,

$$C_6H_6O(COOH)_2,$$

obtained. Knorr found (*Ber.* 17. 2866.) that if instead of employing dilute sulphuric acid, diacetyl suceimic ether be allowed to stand for some hours with oil of vitriol, or if it be warmed with concentrated phosphoric acid, that dehydration without hydrolysis takes place, the reaction following the equation :—

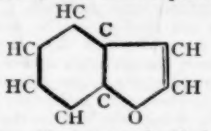


This diethyl ether is readily hydrolysed by alcoholic potash.

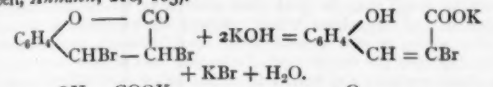
It has been stated above that furfurol shows the reaction of aldehydes. We can obtain a furfuracrylic acid, $C_4H_3O.CH:CH.COOH$, and Pinner (*Ber.* 25. 1414–1427) has prepared furyl cyanide, $C_4H_3O.CN$, and a number of derivatives. The method he employed for the preparation of the nitrile of pyromucic acid was to shake a mixture of aqueous solution of furfuraldehyde and free hydroxyl-amine, and then allow to stand all night; the furfuraldoxime ($C_4H_3O.CH : NOH$), which at first separated as an oil, was thus obtained crystalline. Removal of water from the oxim was effected by heating with twice its weight of acetic anhydride. The furyl cyanide, which boils at 145–146°, may be converted into a furfurimidoethyl ether, $C_4H_3O.C(NH)OC_2H_5$; from the hydrochloride of this compound the hydrochloride of furfuramidine, $C_4H_3O.C(NH)NH_2.HCl$, may be prepared, and so one is enabled to produce difuryl-methylcyanidine :—

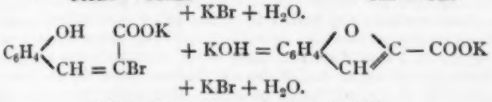
and furyl methyl hydroxy-pyrimidine,

Compounds are known in which aromatic and furfuran nuclei have carbon atoms in common; such a case is presented by cumaron.



When cumarine dibromide is treated with hot alcoholic potash, the alcohol distilled off, and the residue decomposed with hydrochloric acid, the following reactions, leading to the formation of cumarilic acid (cumaron-carboxylic acid), take place (Fittig and Ebert, *Annalen*, 216, 163).





$$C_9H_8O_3K + HCl = C_9H_6O_3 + KCl.$$

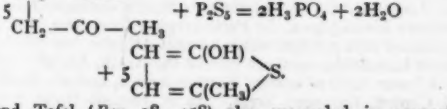
By heating this cumarilic acid with lime, cumaron is produced; it is a liquid boiling at 170–171°, occurring in small quantities in coal tar.

Thiophene is a compound which is constituted similarly to furfuran, but which shows a much greater resemblance to benzene, with which it occurs in coal-tar. Victor Meyer noticed that all specimens of coal-tar benzene give a blue colouration on addition of isatin and strong sulphuric acid, whilst benzene prepared by the distillation of benzoic acid with lime does not behave in this way; this led him to suspect an impurity in coal-tar benzene, which he isolated in 1883 by means of its sulphonic acid, thiophene sulphonating more readily than benzene. The method given for the isolation of thiophene from coal tar benzene is to shake ten volumes of this oil with one volume of concentrated sulphuric acid for four hours, then to remove the benzene layer and saturate the acid with lead carbonate. On distillation of the lead sulphonates with an equivalent quantity of sal-ammoniac, a mixture of benzene and thiophene is again obtained, in which the thiophene is in a greater proportion to the benzene than it was originally.

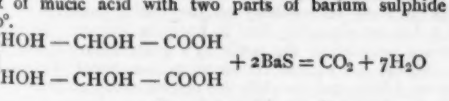
To further purify the thiophene, sulphonation is again resorted to, the distillate being mixed with 100 times its volume of ligroïn, first purified itself by shaking with fuming sulphuric acid, and then shaken for one or two hours with oil of vitrol, using ten volumes to one volume of distillate. The acid layer is then diluted with water neutralised with lead carbonate, and the lead salts distilled with the equivalent quantity of ammonium chloride; the thiophene then obtained is afterwards rectified.

Several synthetical methods for the preparation of thiophene and its derivatives have been worked out since Meyer's first discovery; thus thiophene is formed when ethylene or acetylene is led through boiling sulphur, or by leading various hydrocarbon gases over ignited pyrites. Many carbon compounds containing four carbon atoms also yield this substance when heated with phosphorus pentasulphide, such as crotonic acid, normal butyric acid, ether, erythrite, etc.

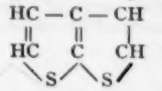
As mentioned above, thiophene shows an extreme resemblance to benzene, to which it approximates in molecular weight; it is a colourless liquid lighter than water and boiling at 84°, whilst benzene boils at 80·4°. Some of the thiophene derivatives have been synthetically prepared; we may note here the preparation of thiotenol, $C_4H_2(CH_3)(OH)S$, by Kues and Paal (*Ber.* 19. 555), who heated three parts of levulinic acid with two parts of phosphorus pentasulphide to 130°–140°.



Paal and Tafel (*Ber.* 18. 458) also succeeded in preparing thiophene-carboxylic acid in the form of its barium salt, by heating one part of mucic acid with two parts of barium sulphide to 200°–210°.

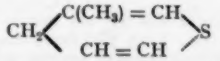


Thiophthen, $C_6H_4S_2$, was prepared by Biedermann and Jacobson (*Ber.* 19. 2445), who distilled citric or carballylic acid with phosphorus trisulphide; its constitution is expressed by the formula,



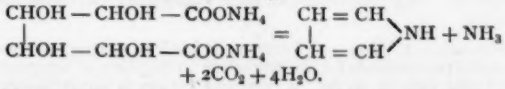
so that it bears the same relationship to naphthalene that thiophene does to benzene.

Closely related to the thiophene compounds is the methyl penthiophene,



of Krekeler (*Ber.* 19. 3270), prepared by slowly distilling sodium β-methyl glutarate $CH_3.CH(CO_2.Na)CH_2.CH_2.COONa$, at a temperature of 180°–250° with phosphorus trisulphide.

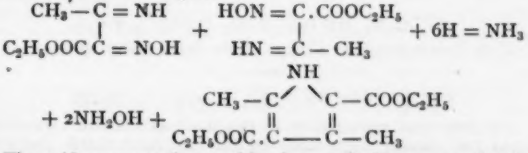
Pyrrol, C_4H_4NH, is a feebly basic constituent of coal tar and bone oil, the imido hydrogen is replaceable by alkyl or acidyl radicles and also metals (*e.g.*, potassium pyrrol, C_4H_4NK). It is a liquid boiling at 131°, and is slightly lighter than water, and may be obtained by several reactions. Thus it is obtained by the distillation of ammonium mucate, or better, by heating the salt with glycerine to 180°–200° (Goldschmidt),



Haitinger (*Monatshefte*, 3. 228) obtained it by distillation of glutaminic acid.

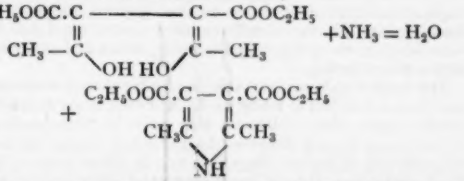
$$C_3H_5(NH_2)(COOH)_2 = C_4H_5N + CO_2 + 2H_2O.$$

Various syntheses of pyrrol derivatives have been effected; thus the imidobutyric ether, $CH_2.C(NH).CH_2.COOC_2H_5$, obtained by the action of ammonia on aceto-acetic ether, was found by Knorr to give an isonitroso-derivative on treatment with nitrous acid. This compound on reduction furnished a dimethyl-pyrrol-dicarboxylic ether according to the equation,



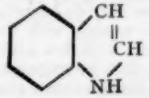
The acid corresponding to this ether readily loses two molecules of carbon dioxide, and passes over into αβ-dimethyl pyrrol, $C_6H_2(CH_3)_2NH$.

Diacetylsuccinic ether furnishes an isomeric dimethyl pyrroldicarboxylic ether on treatment with ammonia,

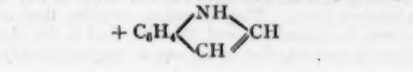


by hydrolysis and subsequent elimination of CO_2 this substance may be made to furnish αα-dimethyl-pyrrol. Acetonylacetophenone furnishes a pyrrol derivative with ammonia, as it gives a methylphenyl-furfuran when simply dehydrated.

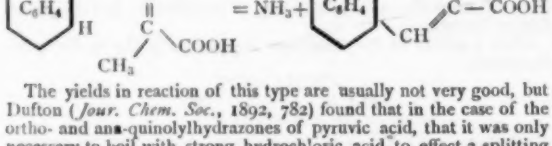
In the same way that cumaron is related to furfuran, so is indol to pyrrol, its constitution being expressed by the formula,



This compound was found by Baeyer and Emmerling in the product of the reduction of ortho-nitrocinnamic acid with potash and iron filings, being formed according to the equation,



A general reaction for the artificial preparation of indol derivatives was discovered by Emil Fischer, who treated various hydrazones of the type $C_6H_5.NH.N = C(CH_3)R$ to the action of zinc chloride at a fairly high temperature. Pyruvic acid phenyl-hydrazone is, for instance, converted into an indol-carboxylic acid in this way,



The yields in reaction of this type are usually not very good, but Dufton (*Jour. Chem. Soc.*, 1892, 782) found that in the case of the ortho- and ana-quinolylhydrazones of pyruvic acid, that it was only necessary to boil with strong hydrochloric acid to effect a splitting off of ammonia and to obtain a practically quantitative yield of quinindol-carboxylic acids. Reference will be made to indol when treating of indigo and its derivatives.

Questions—Advanced.—1. Give two methods for the conversion of benzene into phenol. 2. How is benzaldehyde prepared, and how can it be converted into (*a*) benzyl alcohol, (*b*) cinnamic acid? 3. Describe how you would proceed to prepare the following derivatives from propionic acid, (i.) propionyl chloride, (ii.) propionic anhydride, (iii.) propionamide, (iv.) ethylamine, (v.) ethyl propionate.

Honours.—1. How are furfuran derivatives usually obtained? Describe two methods for the synthetical preparation of compounds containing furfuran nuclei. 2. Describe the way in which thiophene may be obtained from crude benzene. 3. What methods have been used for the synthetical preparation of thiophene derivatives and thiophthene? 4. Point out the relationship of pyrrol to indol, and describe the methods used for the artificial preparation of substituted indols.

HONOURS PHYSIOGRAPHY NOTES.

BY A. M. DAVIES, B.SC. (LOND.), F.G.S.,
Late Demonstrator in Geology at the Royal College of Science.

The Banded Tertiary Gabbros of Skye.

An important contribution to the study of massive crystalline rocks has recently been made by Sir Archibald Geikie and Mr. J. J. H. Teall, in the *Quarterly Journal of the Geological Society* (November 1894). The rocks they describe are some of the deep-seated gabbros which consolidated beneath the Tertiary volcanoes of Western Scotland. Being of so recent a date they have escaped the crushing effects of earth-movements, which have made the original nature of many more ancient igneous rocks so difficult to elucidate, and all the structures they present must date from their consolidation, excepting only the unimportant and easily recognized effects of weathering.

The banded gabbros occur in successive sheets, varying in thickness from a few feet to many yards, and each sheet consists of many parallel layers whose thickness also varies in corresponding degree. Traced along for any distance the individual layers thicken or thin out, and may disappear altogether, and in places some of them show sharp puckerings, though layers above and below may be horizontal. In both these characters these rocks resemble many Archæan gneisses. The bands are due to unequal aggregation of the constituent minerals of the rock, felspar predominating in the pale ones, ferro-magnesian minerals and magnetite in the dark ones, while magnetite alone may form thin black layers. There is no sharp demarcation between the layers, the minerals interlocking along the junctions just as they do anywhere else; and there is no arrangement of individual crystals with their long axes parallel to the banding, such as results from flow structure.

The authors recognize that heterogeneity of igneous rocks is in many cases due to one of the two causes already recognized, namely, differentiation in place after intrusion, and successive intrusion of magmas of different composition (possibly themselves the products of differentiation in a single magma deeper down). But they find that neither of these explanations will hold for the Skye gabbros: the first does not account for the puckering of the layers nor for their alternating arrangement, and the second is negatived by the absence of sharp demarcation between the bands or any sign of interaction between them. They therefore consider that a third explanation must be looked for, and this they find in the *intrusion of a heterogeneous magma*, that is to say, a magma already differentiated below, but not to such an extent as to prevent the simultaneous eruption of the whole. By deformation during intrusion the banded and other structures were produced.

These conclusions are applied to the case of the Archæan gneisses of Scotland, many of which show a striking resemblance to the Tertiary gabbros, though often obscured by the secondary structures set up by crushing, etc. The closest resemblance occurs precisely in those areas where other indications (namely, the absence of deformation in the dykes which cross the gneisses) point to a comparative absence of secondary changes.

Climatic Zones in Past Geological Periods.

Although some approximate idea of the successive climates of a particular small area in geological time may be formed from the nature of the organisms which successively inhabited it and left fossil remains, as well as from other considerations, any attempt at a restoration of the distribution of climates, and of land and sea, for the whole world at any period is necessarily a very difficult matter, on account not only of our ignorance of the geology of many parts of the world, but of the uncertainty both of correlation of deposits in far-separated areas, and of the conclusions to be drawn from the distribution of extinct forms of life. The older geologists even came to the conclusion that climatic differences were practically absent in periods earlier than the Tertiary, but more extended discoveries have completely exploded this view, though it is still to be found in some text-books. The first successful attempt at a world-wide restoration of climatic conditions was made ten years ago, for the Jurassic system, by the late Dr. Neumayr, of Vienna. He followed up the work of previous observers by recognizing that the Jurassic faunas of Europe might be distinguished into three well-marked provinces which extended east and west across the continent: a northern or Boreal province, including Central or Northern Russia, Novya Zemlya, Spitzbergen, and Greenland; a Central European, including Britain, Germany, the Baltic area, and most of France; and a Mediterranean, including Spain, Italy, the Alps, Carpathians, and the Balkan Peninsula. The first of these has a marked absence of the coral-reefs which abound in the second, and as reef-building corals at the present time have their range strictly limited by conditions of temperature, the conclusion is natural that these provinces were of climatic origin. The second and third ones were distinguished chiefly by the genera of Ammonites that occur in them, and as Ammonites are entirely extinct no precise conclusion can be drawn as to the causes which affected their distribution; but on extending his observations outside Europe, Neumayr showed that the Mediterranean zone extended about equally far north and south of the Equator, and that in South Australia and New Zealand, the Cape, and southern South America there is a reappearance of Central European types. We thus have at least four zones—Boreal, North Temperate, Equatorial, and South Temperate—which are as definite in character as those of the present time. Neumayr further pointed out the remarkable way in which the ocean gradually extended itself as Jurassic time went on, so that the continents were gradually restricted, and islands disappeared. A map which he drew of the distribution of land and sea in later Jurassic times shows three main continents—a Nearctic one, occupying most of the present Atlantic and eastern North America; a Brazilio-Æthiopian, including most of modern South America, the South Atlantic, and most of Africa, and sending out a long peninsula from Madagascar to India; and a Chino-Australian one, uniting Eastern Asia to Australia. While much of this is hypothetical, the indication of coast-lines in places, and the evidence of land barriers between others, is perfectly clear. It may be pointed out that the evidence which leads to such a geographical reconstruction is distinctly opposed to the doctrine of the permanence of oceans. Quite recently Dr. Kossmatt, of Vienna, has attempted to apply Neumayr's methods to the Cretaceous Period, though his results are as yet incomplete. Evidences of climatic zones are less definite, while provinces separated by land-barriers are clearly distinguishable. In the Northern Hemisphere, the Pacific region forms one clear province, in contrast with another which he calls Atlantic, but which probably did not include the northern part of the North Atlantic, while it extended over much of eastern North America, and the Mediterranean and Central European areas. As in Jurassic times, there was a marked distinction between the Central European and Mediterranean provinces, and the latter extended east and west from Northern India to Peru, encroaching on the Pacific province at the latter point, but not extending into it from the former. Its eastern portion was bounded to the south by a great Indo-African continent, but this did not extend farther west than about the existing west coast of Africa, and so while the marine areas of North and South India by their entirely different faunas are shown to have had no direct communication, a line of communication can be traced from Southern India, through Natal and Angola to Brazil and to the Central European province. The latter half of the Cretaceous

period is well-known to have been accompanied by an enormous extension of the sea over regions that had been dry land for ages, a transgression more extensive than that of the Jurassic sea, and leading in North America to an invasion of the Pacific area by an Atlantic fauna.

Origin of the North Atlantic Ocean.

There is much evidence that during most of the recognised periods preceding the Tertiary, the northern part at least of the North Atlantic was occupied by a continent, and that the main ocean then covered central and southern Europe, and stretched across the southern part of the North Atlantic to the Antillean region : of this the existing Mediterranean is the chief surviving remnant. The gradual conversion from these conditions to those of the present time seems to have proceeded during the whole of the Tertiary period. The evidence for this was recently laid before the Royal Geographical Society by Dr. J. W. Gregory. He pointed out that the earliest Tertiary deposits on either side of the Atlantic show a close similarity in their fossils, which indicates the existence of a shallow-water connection across the site of the present ocean. In succeeding beds, however, there is evidence of a separation of the two regions by a barrier that prevented migration from one to the other. This barrier is obviously the deep ocean, and hence there is a gradually increasing difference in the shallow-water faunas of the two sides of the Atlantic from early Tertiary times to the present day. The exact nature of the earth-movements that produced the North Atlantic depression cannot be definitely ascertained as yet, but they are probably to be correlated with the sudden outburst of volcanic activity which occurred in Britain at the commencement of Tertiary times, after the enormously long interval in which no trace of such action had been manifested, as well as with the abrupt change in the nature of the sedimentary deposits from the deep-sea chalk to the shallow-water sands and clays of the British Tertiaries.

SCIENCE NOTES.

Citric Acid from Cane Sugar.—Some two years or more ago a discovery in bacteriology caused great excitement among botanists and chemists. A certain organism was investigated, with the result that it was found capable of forming citric acid when cultivated in a solution of cane sugar. The effect of this upon the manufacture of citric acid was very great, and preparations were made for utilising the discovery upon a scale suitable for making it of commercial importance. The relation thus found to exist between cane sugar and the acid has since caused investigations to be carried out with a view to determining whether the transformation from the one into the other may not be possible without the intervention of vegetable protoplasm. Some experiments recently published by Dr. T. L. Phipson seem to answer this question in the affirmative. By the action of permanganic acid, citric acid in small quantities can be produced from cane sugar. Dr. Phipson's method consists in acidulating the solution of sugar with a few drops of sulphuric acid and adding a strong solution of permanganate of potassium. In a short time the colour of the permanganate disappears and the solution becomes transparent. It is then neutralised with ammonia and calcium chloride added, when, on boiling, a precipitate is formed which is soluble in acetic acid. This calcium-containing precipitate is collected and decomposed with sulphuric acid. The resulting liquid is then concentrated by evaporation over a water bath, when gradually small but well-formed crystals make their appearance, which correspond in shape and properties with those of pure citric acid. In carrying out this process it is very important to regulate the amount of permanganate used, as excess leads to the formation of oxalic acid in addition to the citric. The discovery is of great interest to botanists in giving a clue to the mode of formation of citric acid in certain fruits, showing that it may arise from sugar by the ordinary processes of slow oxidation which are always going on in the vegetable cell.

***

Effects of Heat on Milk.—It has long been known that when milk is heated the colour changes from the pure white of the normal liquid to a yellowish tinge. From some experiments recently carried out by Messrs. Cazeneuve and Haddon, it has been ascertained that this change of colour is due to an oxidation of the milk sugar or lactose in the presence of certain alkaline salts which are present in the milk. The sugar undergoes a decomposition, being converted with formic and other acids, which coagulate the casein, leaving it otherwise unaltered, except that it is coloured yellow by substances formed at the expense of the lactose.

Size of Drops.—When various liquids are dropped from tubes of uniform size differences are found to exist in the size of the drops. The formation of these drops has recently been investigated by F. Eschbaum with a view to determining the causes of these variations in size. The factor which he finds to influence them is not the size of the aperture in the tube as one might expect, but rather the outside diameter of the tube itself. With the same liquid, if tubes of different diameters are used to form the drops, the latter are found to vary in dimensions. Eschbaum has lately published a table showing the relative weights of drops of various medicinal agents. The value of this in medical prescriptions is greater than at first sight appears, as it will become possible by its use to ensure a uniformity which mere indications of number of drops fails to secure.

***

Copper Compounds in Agriculture.—The practice of using copper salts as insecticides is a very usual one in agricultural operations, and it becomes important to ascertain whether the accumulation of such copper compounds in the soil has any ill effects upon subsequent crops or upon human beings and animals consuming the produce. M. A. Girard has carried out for several years past experiments to determine this point. As a result of his investigations he has established the fact that there is no falling off in the crops. Moreover, a careful examination of the different vegetable products shows that they have no deleterious effects upon any animals which subsequently eat the produce.

***

Vegetable Cholesterins.—Various bodies belonging to the cholesterins occur in many plants, especially among the lower cryptograms, such as yeasts, moulds, and lichens. These have not received till recently much attention among physiological chemists. It is interesting to record some investigations recently published by M. E. Girard. He inclines to the idea that all the cholesterins existing in these lowly plants belong to a special group, the *ergosterin* group. They are coloured red by concentrated sulphuric acid, instead of yellowish-brown as is animal cholesterin. When water is added to the solution of these bodies in the acid, there is, with vegetable cholesterin, a green precipitate, while with the product of animal origin the precipitate is white. Further differences appear with other solvents. Thus if carbon tetrachloride be used, and sulphuric acid be added to the solution, the animal product gives a yellow colouration, which becomes milky white on the addition of water, whilst the tetrachloride separates uncoloured. With the ergosterin group under similar treatment, the liquid becomes blood-red, and the separated tetrachloride becomes green. If chloroform be used to dissolve the cholesterins, addition of benzoic anhydride and sulphuric acid will distinguish between the animal and vegetable ones. In the former case, the chloroform separates with a blood-red colour, which changes to violet if allowed to stand twenty-four hours, and the sulphuric acid becomes brown with an intense green fluorescence. With the ergosterins on the other hand the chloroform is coloured yellowish-brown, and becomes colourless in twenty-four hours, while the sulphuric acid, though turning brown, has a very faint green fluorescence. The appearance of the vegetable cholesterins when isolated is crystalline, but the crystals differ from the plates of animal cholesterin. That of beer-yeast is found to be composed of fine needles, which possess a very decided dextrorotatory power.

***

Properties of Acetylene.—P. Villard has recently published some new facts about this gas. When prepared by Moissan's process, it resembles carbon-dioxide in becoming solidified by its own evaporation when in the liquid state, and under ordinary atmospheric pressure. It is solid at —85° C., its fusing point is —81° C., and the co-efficient of solubility of the gas at 0° C. under a pressure of 4·65 atmospheres is 1·6. Acetylene hydrate $C_2H_2 \cdot 6H_2O$ is formed under the same conditions as the hydrate of nitrogen protoxide or carbonic acid, is denser than water, and forms crystals which are without action on polarized light.

***

Recent Losses in the Scientific World.—The recent death of Professor Huxley has caused a grave loss to biological science. Whether regarded as teacher, philosopher, or investigator, no man in recent times has made such a mark in all the fields of natural history. The present great advance in nearly all branches of research has been largely due to his influence, and no one has succeeded in infusing similar enthusiasm into his students and followers. Occurring at almost the same time, the death of Professor Williamson, late of the Owen's College, Manchester, has not received so much attention as such an event otherwise would have done. It is to the late Professor's careful and laborious investigations, extending over many years, that most of our knowledge

of the vegetation of the earth in the time of the formation of the coal measures must be attributed. The record of this work may be found in a large number of papers in the Philosophical Transactions of the Royal Society. Recently Professor Williamson in collaboration with Dr. Scott, F.R.S., of Kew, began the publication of a new series of papers dealing with the same subject, but discussing more completely the anatomical and histological features which the plants of the coal measures exhibit. Three very elaborate papers, dealing with fossil Equisetaceæ and Ferns have already appeared. It is understood that the conjoint work will now be continued by Dr. Scott alone. It will be based almost entirely upon Professor Williamson's collection of fossil plants, which is unique in its completeness.

REVIEWS.

Ovid: Heroidum Epistulæ XIII. Edited by E. S. Shuckburgh. Macmillan & Co.

This volume, one of Macmillan's well-known red series, is of a more scholarly cast than the preceding, which are intentionally cram books. It is by no means a new one, having been published some ten years ago, but its merits deserve to be kept before the public. Mr. Shuckburgh, in his Introduction, holds a brief for Ovid, whose character he tries to show was, if not eminently noble, yet free from pettiness; he also discusses well, in a short space, the cause of his exile. As regards the seven epistles commonly considered spurious, he contents himself with a bare mention of the fact as a reason for their omission here, without entering into the question. There is an account also of the MSS. and preceding editions.

In the Notes the grammatical references are all to Roby. Other references are full, but there are some trifling misprints; *e.g.*, towards the end of the introduction to Epistle I., v. 15 should be v. 38. In the same epistle, the reference to 2, 37, in the note on line 45 (*sinus*), is irrelevant. The notes contain, as is right, a minimum of actual translation, and as far as can be seen, there is nothing that could be spared or improved upon. In III. 77, however, 'bully' is not a very poetical word for *exagitet*. The book closes with a valuable index, by which the author's use of words can be thoroughly mastered.

Euripides: Andromache. Text and Notes. Edited by H. Clarke. 'University Tutorial Series.' W. B. Clive.

There is a great deal of matter worked into the 14 pages of Introduction to this book. The origin, history, and description of the Greek Drama are all given. The space allotted to the question of metres seems almost too large, seeing that the subject is for a Matriculation Examination, that of the London University in 1896. The Greek Theatre is described as well as the conflicting evidence of recent excavations permits.

As far as can be seen from a hasty perusal of the notes, they are good, leaving almost all renderings to the translation which is to accompany this volume. At the same time they often presuppose in their readers a better knowledge of grammar and verb-forms than would probably be found among a large number of those who are likely to use the book, and it is mainly for these latter, presumably, that it is written. For such students the word 'proleptic' (note on line 130), for example, and the phrases 'supplementary participle' (136), 'Infinitive of limitation' (290), would perhaps be hardly clear enough.

There do not seem, however, to be mistakes in Scholarship.

Horace: Epodes. Edited by J. Thompson. Text and Notes. 'University Tutorial Series.' W. B. Clive.

As part editor of Xenophon's 'Æconomicus,' in this series, Mr. Thompson's work has been recently noticed in this paper. The notes in this edition of the Epodes are in the same style, with even less of mere translation given. A full translation is published separately along with one of the Odes. The Introduction includes a short life of Horace, with account of the place held by the Epodes among his works, and as an index to his worldly position at the period of writing, and also a full description of the various metres. There is little to remark in the notes. In IV. 8, a description of the toga would make it clearer what is meant by the phrase 'breadth of the toga.' Again, in XIV. 8, the restrictions of the use of the dative of the Agent are not explained; a fuller note would be desirable. An Index of Proper Names at the end gives all the mythological and historical references required; but did Achilles drag Hector *round* the walls of Troy?

The subject here treated is one of those for the B.A. Examination at London University in 1896.

Waddington's 'Monthly Progress' Test Cards. Standards III.–VII. By R. Waddington. London: Simpkin, Marshall & Co.

Mr. Waddington is wise in issuing his Monthly Progress Cards, for it is certain that under altered conditions of work will arise greater and greater necessity for making each stage of school work complete and accurate. To bring about this necessary end the Monthly Progress Cards will be very useful, especially as the work required is well within the capacity of the children. We notice on Card II. of Standard V. that the last sum of the fifth month test is, by a printer's error, carried on in part to the sixth month. The cards should have a good sale.

Monthly Progress Syllabus Report and Examination Register. By Messrs. Waddington and Jackman. London: Simpkin, Marshall & Co.

Since we first reviewed this handy little help, we have had to examine several others of its kind; still we have to say that the Monthly Progress Syllabus is as good as any in the market, and may be safely recommended to the notice of any teacher desiring a register of syllabuses and results.

Cambridge Natural Science Manuals: Statics. By R. T. Glazebrook, M.A., F.R.S. C. J. Clay & Son.

This further instalment of Mr. Glazebrook's Natural Science Series is fully up to the high level of merit reached by the preceding volumes, whether from the point of view of matter or of form. Excellent exposition, backed up by admirable illustrations, and tested by numerous suitable examples—these are the features which render the book indispensable to all who would attain to an exact scientific knowledge of Statics.

Magnetism and Electricity. By W. J. Harrison, F.S.S. Stage I., Magnetism; Stage II., Frictional Electricity; Stage III., Voltaic Electricity. London: Thos. Nelson & Sons.

Intended as manuals to be used by scholars who are taking 'electricity' as a 'specific,' these little books should be clear, simple, and illumined by suitable diagrams. This Mr. Harrison has recognised, and we can find no fault with his selection of matter and his illustration thereof. Messrs. Nelson have produced the book in their usual excellent style, so that a large meed of popularity may be expected for Mr. Harrison's booklets.

Object Lessons in Botany, from Forest, Field, and Garden. Book II. By E. Snelgrove, B.A. London: Messrs. Jarrold & Sons.

Of Mr. Snelgrove's preceding volume we were able to speak in terms of praise. His second part is well worthy of his first, so that we strongly recommend all who have to do with the teaching of botany, either in object lessons or as a specific subject, to possess themselves of Mr. Snelgrove's book, from which many and various hints will be garnered, calculated to make the teaching of this delightful subject more and more educational and enjoyable, because more and more practical and observational. A somewhat lengthy experience in teaching this subject makes us appreciate to the full Mr. Snelgrove's very sensible *modus operandi*.

Murché's Science Readers. Books I.–III. London: Macmillan & Co.

These little volumes are a kind of supplement or complement to Mr. Murché's Object Lessons in Elementary Science, which have lately been reviewed in these columns. The lessons are told under the guise of repetition at home of what has been learnt at school by three children. Mr. Murché has succeeded in giving an air of reality to his lessons, and rarely does he offend by creating improbable situations. The books would be admirable aids to recapitulation of oral lessons, for which purpose we strongly recommend them.

McDougall's Higher Grade Arithmetic in Theory and Practice. London: McDougall's Educational Company, Limited.

The aim of the author of this work is to meet the requirements of pupil teachers in elementary schools, candidates for University and Civil Service examinations, and generally of pupils of senior classes in arithmetic. The first chapter treats of 'Measures and Multiples,' and amongst those which follow are chapters on fractions, vulgar and decimal, ratio and proportion, percentages, stocks and shares, the metric system, areas and volumes, exchange, and approximate calculations.

The whole subject is treated in a very practical manner. Brief and clear explanations are given of the various principles and processes dealt with. Abundant examples for practice are arranged in more than one hundred exercises. Sections are devoted to the unitary method, chain rule, averages, thermometrical scales, and many other matters of interest.

The book is well printed on good paper and substantially bound.

The Royal Mental Arithmetic Drill Sheets. London: T. Nelson & Sons.

This set of Mental Arithmetic Drill Sheets will prove, we believe, a very effective piece of time and labour-saving apparatus for use in schools. Twelve large sheets, measuring 41 inches by 32 inches, are affixed to a roller so that any sheet may be displayed before a class. On each sheet lines or other arrangements of figures are so presented as to afford an endless number of exercises for mental calculation. Thus, on one sheet we have a long succession of figures in two lines, and the pupils may be required to add each figure to the one below it, or to the one following it. Another exercise may be to take each figure in the second line from the one above it, or each figure in the first from the one below increased by ten. The second sheet presents what is called an Addition Drill Circle. Sixteen digits are placed in a circle in irregular order: the teacher points to any digit, the pupils have to add the other digits in succession until the sum reaches 40 or some other limit. Other sheets supply exercises of a more advanced kind on the Compound rules, Calculation of Prices, Practice, Fractions—vulgar, decimal, and circulating—and on Interest.

In order that the figures may be easily distinguished, they are printed in bold type, and in red and black alternately, unless the nature of the exercise makes some other arrangement of the two colours more convenient.

One important advantage attending the use of these charts is the saving of the teacher's voice. After a word or two of simple direction the pointer will suffice to carry a class through a long series of examples.

As the series includes the work of all the standards, the teacher has a ready means of revising back-work and of making preparation for future stages of progress. The publishers, however, might do well to issue some of the earlier sheets as a separate section for use in the lower standards, which would certainly not require the more advanced sheets.

An explanatory hand-book is supplied with each set of charts.

Mopsie: The Story of a London Waif. By Dorothy Walrond. London: T. Nelson & Sons.

Mopsie, a girl of the street Arab type, possesses striking features of character, and the story of her reclamation, beset as it is with singular chances, is full of interest. Indeed in some incidents, as in the preaching of Captain Grey, a lady of the Salvation Army, and in the death of a baby as the result of the mother's drunken brawling, the interest so nearly approaches what is called powerful, not to say sensational, that one is moved to doubt whether the story is altogether suitable for children's reading.

The character of Mr. Whineatt is well drawn, and the interplay of this character and that of Mopsie is skilfully managed. The moral teaching is excellent, but the story is brought to an end rather too abruptly.

Typical Government Problems: Standards II. and VI. London: Blackie & Son, Limited.

The title page describes each of these books as 'a collection of Arithmetical Problems set by Her Majesty's Inspectors, arranged and graduated for schools.' We need only say that the description is exactly realised, the arrangement and graduation are very satisfactory, and the books cannot fail to be of much use in the trying task of teaching young children to work problems.

Blackie's Comprehensive Arithmetics: Standards V., VI., and VII. London: Blackie & Son, Limited.

In these books brief explanations of the rules are given, with illustrative examples worked out; but the main feature is a very copious collection of examples for practice arranged under the heading of the different rules included in each standard. Each book has a good set of examination tests, and that for Standard VII. covers the arithmetic required of pupil teachers. The print and paper are excellent.

Blackie's Descriptive Geographical Manuals: No. 4, Europe. By W. E. Baker. London: Messrs. Blackie & Sons.

The manuals of which Europe is fourth in order should meet with a wide popularity, insomuch as they deviate from the beaten track of the ordinary text-book, both in matter and in illustrations, in giving descriptions of noted scenes mostly in the words of eminent travellers. There is a freshness also about the mere ordinary matter which relieves the toil of reading very considerably. A word of praise must be given to the illustrations, which are both numerous and admirable.

Varied Occupations, their Principles and Purposes. By H. Holman, M.A. (Isbister & Co.)

It is comparatively seldom that we get any book from Her Majesty's Inspectors which is of much assistance to teachers, and on that account we more heartily welcome the book before us. Mr. Holman is not only an Inspector, but also a trained teacher, and, therefore, capable of giving advice on a subject which has presented many difficulties to the profession. The book deals with the nature and purpose of the occupations, the chief educational principles involved, the chief values of the subjects, and some practical hints, to which is appended a list of books on the subjects. Though not professing to be exhaustive, the book contains practically all that need be said on the subject. It is written in a most interesting and highly practical manner, and we advise our readers, one and all, to obtain a copy; they cannot fail to find something new and useful.

Short Notes on the Book of Joshua. By the Rev. W. G. Whittam, M.A. London: Relfe Brothers.

The Book of Joshua is full of interest which appeals to young readers, and it affords abundant scope for interesting annotation. Mr. Whittam has taken full advantage of his opportunity, and though his notes may fairly be called short, they are such as will materially add to the interest of lessons on the supplementary book of the Pentateuch. The best authorities have been consulted, and references to the works of Dean Stanley, Bishop Wilberforce, Professor Sayce, Dr. Maclean, and Dr. Thomson, the author of 'The Land

and the Book,' are very numerous. The text of the Book of Joshua is not included, but the notes appear to us likely to be really helpful to teachers and young students.

Weaving in Straw, Cloth, or Felt. By Lucy R. Latter. London: George Philip & Son.

Miss Latter's experience as a Superintendent of Method in Infant Schools under the School Board for London has enabled her to produce a number of little books for the guidance of teachers of young children. The one before us sets forth 'a graded set of exercises suitable for children from six years of age and upwards.' The scheme is a development of the Kindergarten occupation of paper weaving, and the exercises to be worked in more durable materials are carefully described, and include the weaving of such useful articles as mats for flower pots, a kettle holder, bags, and a baby's shoe. To teachers looking out for help in the matter of varied occupations, Miss Latter's book may be commended.

Varied Occupations: a Class Subject. London: George Philip & Son.

This is a tiny brochure of very few pages in which an anonymous writer, in full sympathy with the new departure in elementary education, endeavours to commend to teachers the new requirement of Advanced Kindergarten Occupations, and to point out how Circular 332 and the requirements of the New Code may be adequately met. A copy of the circular and the list of suggested occupations are included. The brief comments on these may prove helpful and reassuring to teachers who have been somewhat alarmed by the new demands of the Education Department.

Botany Lessons for Young Children. By Dora Pearce. London: George Philip & Son.

The twelve lessons sketched in this short course are extremely simple, carefully graduated, and truly educative in matter and method. The writer shows much sympathy with her subject, and also with the child mind. From some of the suggestions made, one would infer that the classes with which the writer's thoughts and experience are concerned are smaller than those usually found in elementary schools. But the guidance could be readily adapted to such classes. Some very clear illustrations are given, such as could easily be drawn on a larger scale for black-board sketches.

The Citizen of England: his Rights and Duties. By G. Armitage-Smith, M.A. London: W. & R. Chambers, Limited.

The special studies and practical experience of Mr. Armitage-Smith as a University Extension Lecturer on Social Economics and allied subjects, have enabled him to produce a capital book for the popular and useful subject of Civic Duties as prescribed in the Evening Continuation School Code.

By the use of a clear, rapid, condensed style of exposition, a small volume of scarcely two hundred pages is made to contain a remarkable amount of accurate and well-arranged information. The modern movement for securing popular education, the development of rational ideas on sanitary matters, and the recent changes in local government are dealt with in a manner to attract interest, and at the same time stimulate inquiry. The work of the central Government, of Parliament, and of the Executive are carefully defined and explained. The subjects of Justice and Police, Taxation, Social and Industrial Life, and the growth of the empire are all ably treated, and the information throughout is brought fairly up to date.

The statement on page 70, that 'the House of Lords consists of 576 members,' may prove misleading, as it might be supposed that the number was definitely determined by law, as the number of the members of the House of Commons is, instead of being subject to fluctuation by some peerages becoming extinct. We miss also any statement that minors cannot sit in the Upper House. Again, the recently-introduced plan of forming Grand Committees in the House of Commons is not mentioned. These, however, are but slight deficiencies, and we think the book a very satisfactory one.

Cassell's Belle Sauvage Readers. First, Second, Third, and Fourth Books. London: Cassell & Company, Limited.

The most striking feature of this new series of Reading Books is their eminently literary character. This is shown especially in the early stage at which the editor has introduced matter which may fairly be regarded as genuine literature. In the very first book we find simple poems by William Blake, Rogers, Lyly, and Campbell, and stories by Miss Edgeworth, as well as some of the delightful old fairy tales and chapters on King Arthur and St. George.

The Second Book contains the story of the Golden Fleece in six parts, and the tale of Troy and the Wooden Horse, and the editor further draws upon the Brothers Grimm, Hans Andersen, and Mrs. Ewing for prose, and on Cowper, Keats, Goldsmith, Blake, and Herrick for poetry.

In the Third and Fourth Books, where the need for extreme simplicity is of course less felt, and where consequently the editor has a wider range of choice, we find more serious and more eminent writers largely represented. In the Third book are extracts from Bunyan, Swift, Gray, Wordsworth, and Coleridge; and in the Fourth from Washington Irving, Scott, Prescott, Macaulay, Palgrave, as well as some scenes from Shakespeare.

It should also be noted that while a high character has thus been maintained for the matter of the reading lessons, the importance of freshness and simple interest has not been lost sight of. Children will be likely to find these books less dull and not more difficult than many others which consist of lessons specially written, and therefore of a lower literary type.

All the volumes are well printed, suitably illustrated, and strongly bound in smooth green cloth boards.

Scholars' Certificates: New Designs. London: The Educational Supply Association, Limited.

These ornamental certificates, of tasteful design, are of three different patterns, and each is printed in various sizes. They are so prepared that any words may be printed on the blank portion to indicate the purpose of the certificates, according to the wishes of those using them. Two of them are handsome floral designs, in well-harmonised colours, and a third exhibits a fine interior view of a cathedral. The latter would appear to be well suited for certifying success in Scripture examinations.

The series is well worthy of the attention of teachers requiring certificates for their scholars.

Exercises on Spelling, Dictation, and Composition, for Junior Forms. By F. C. Load, B.A. London: Relfe Brothers.

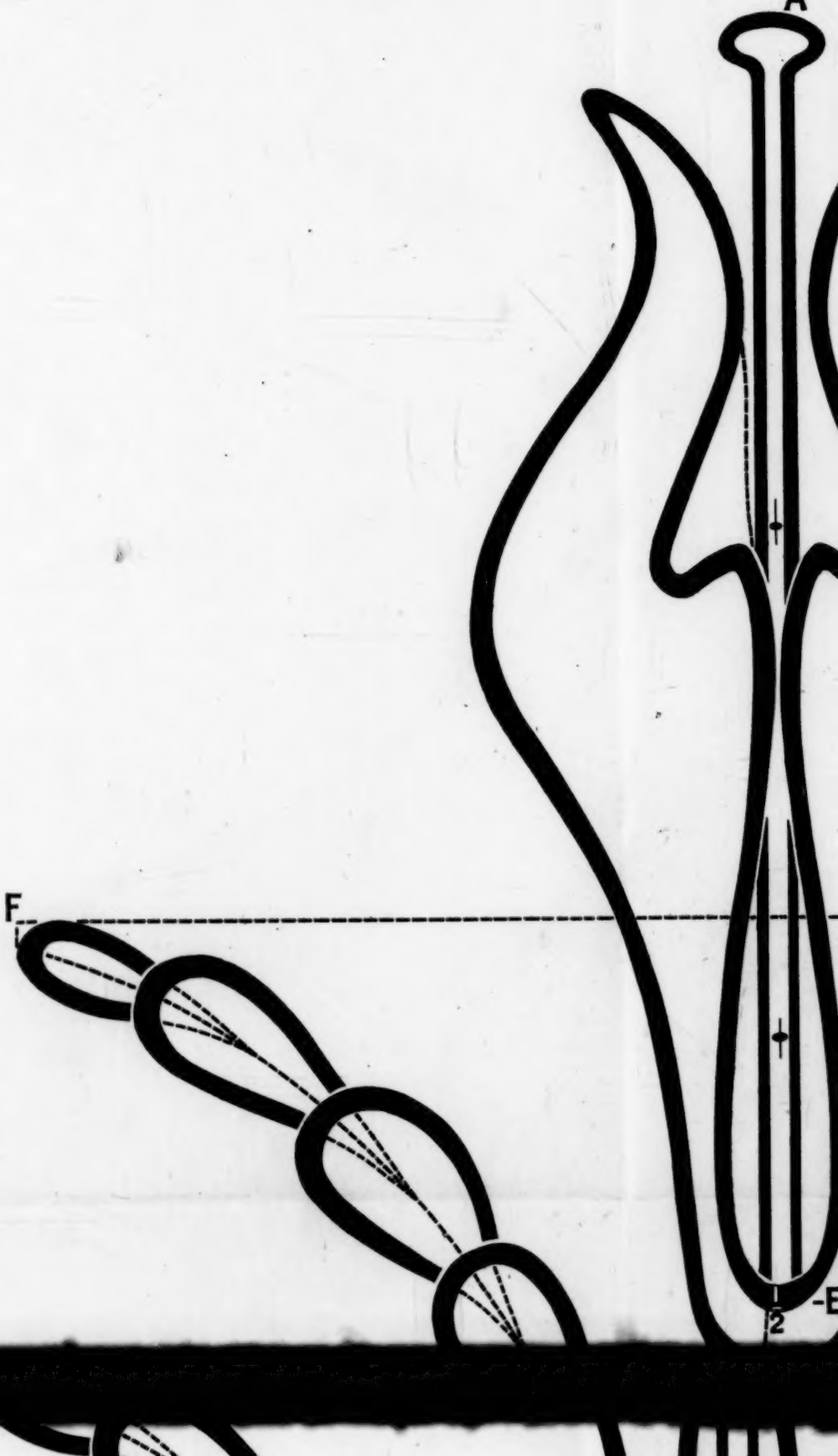
The author claims for this little work that it introduces a new method of teaching the subjects with which it is concerned. At each opening of the book we find on the right-hand page a couple of short passages of prose narrative. On the opposite page is a list of the more difficult words contained in the extracts. Each word in the list is followed by an indication of the pronunciation and a brief explanation of the meaning. It is intended that the pupils should study this list, then write the extract from dictation, and afterwards reproduce the substance of it in their own words. The scheme has merits, but its novelty does not amount to much.

The plan for indicating pronunciation is fairly simple, but it is very imperfectly carried out, and abounds in inaccuracies. For example, the words *amount* and *agreement* are marked as having the *a* long; *varying* and *variable* as having the first *a* short; the first *e* in *irresistible* has the short sound of *e* on one page, and the short sound of *i* on another; *hoar-frost* is printed as having short *o* in the first syllable; the *e* in *regions* is long on one page and short on another. If any attempt is made to mark pronunciation for school children, the use of diacritical marks should above all things be consistent. Otherwise it is worse than useless.

PRINCETON 27 AUG 95

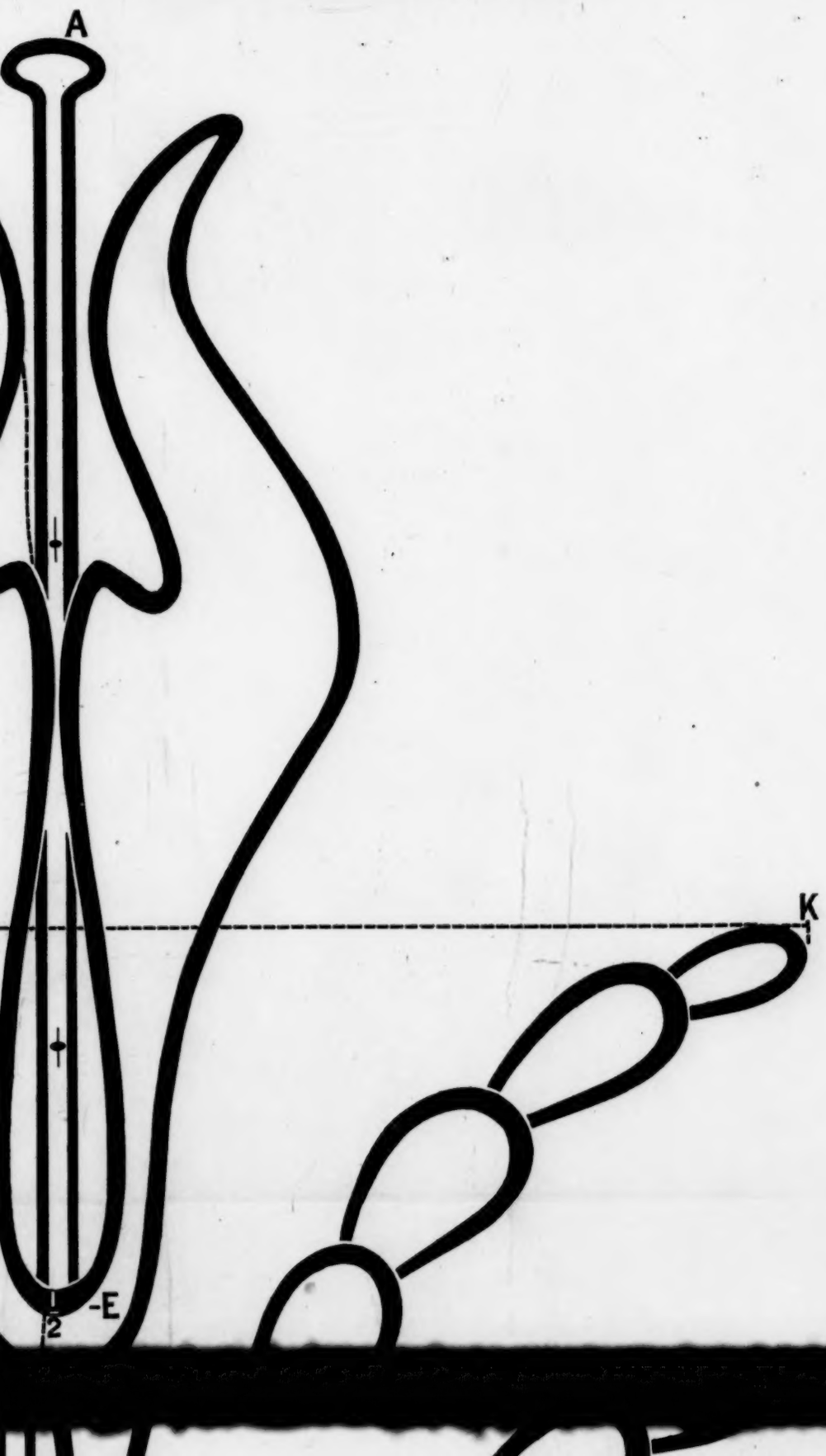
GOVERNMENT EXA

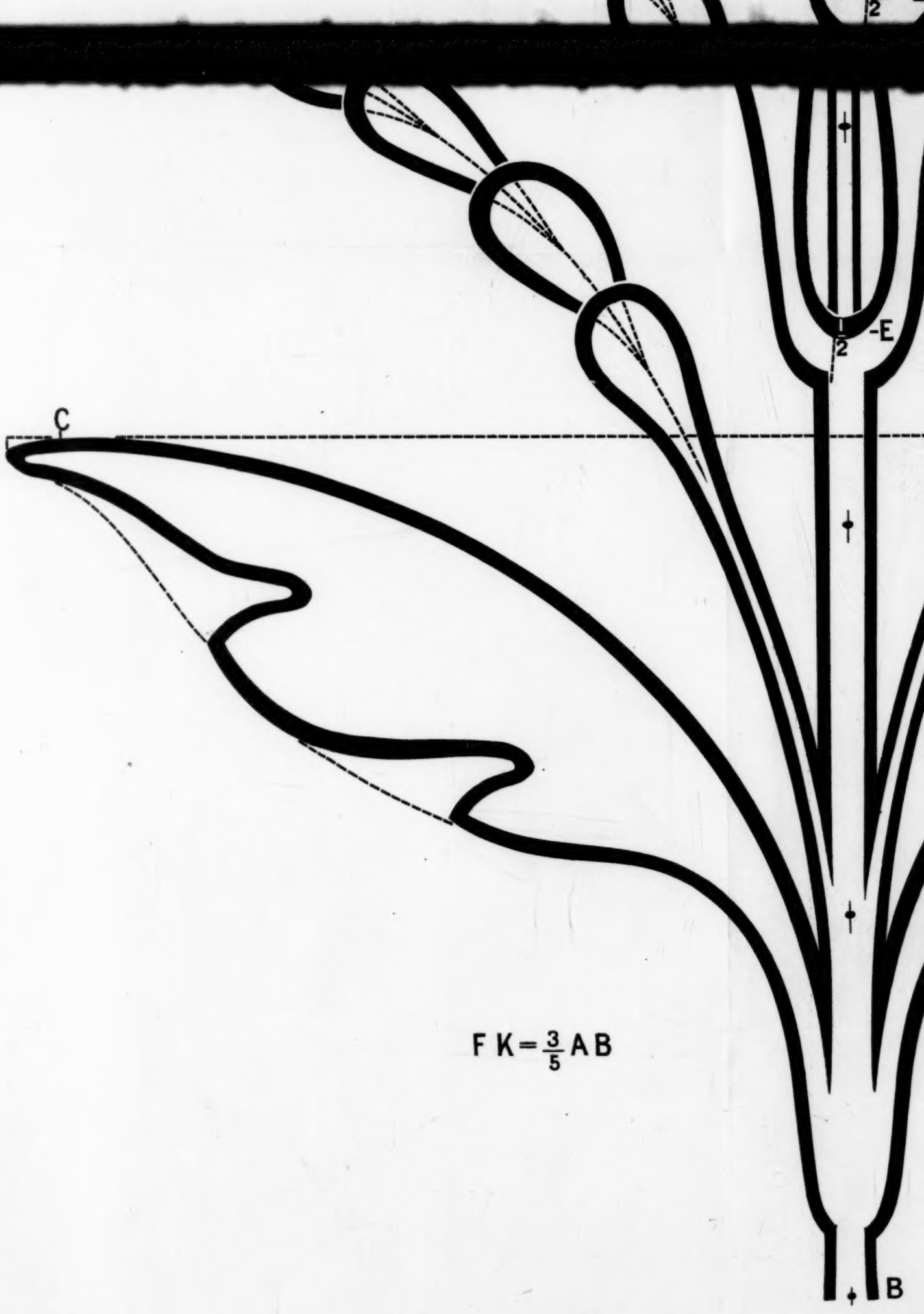
ST. V. FRE



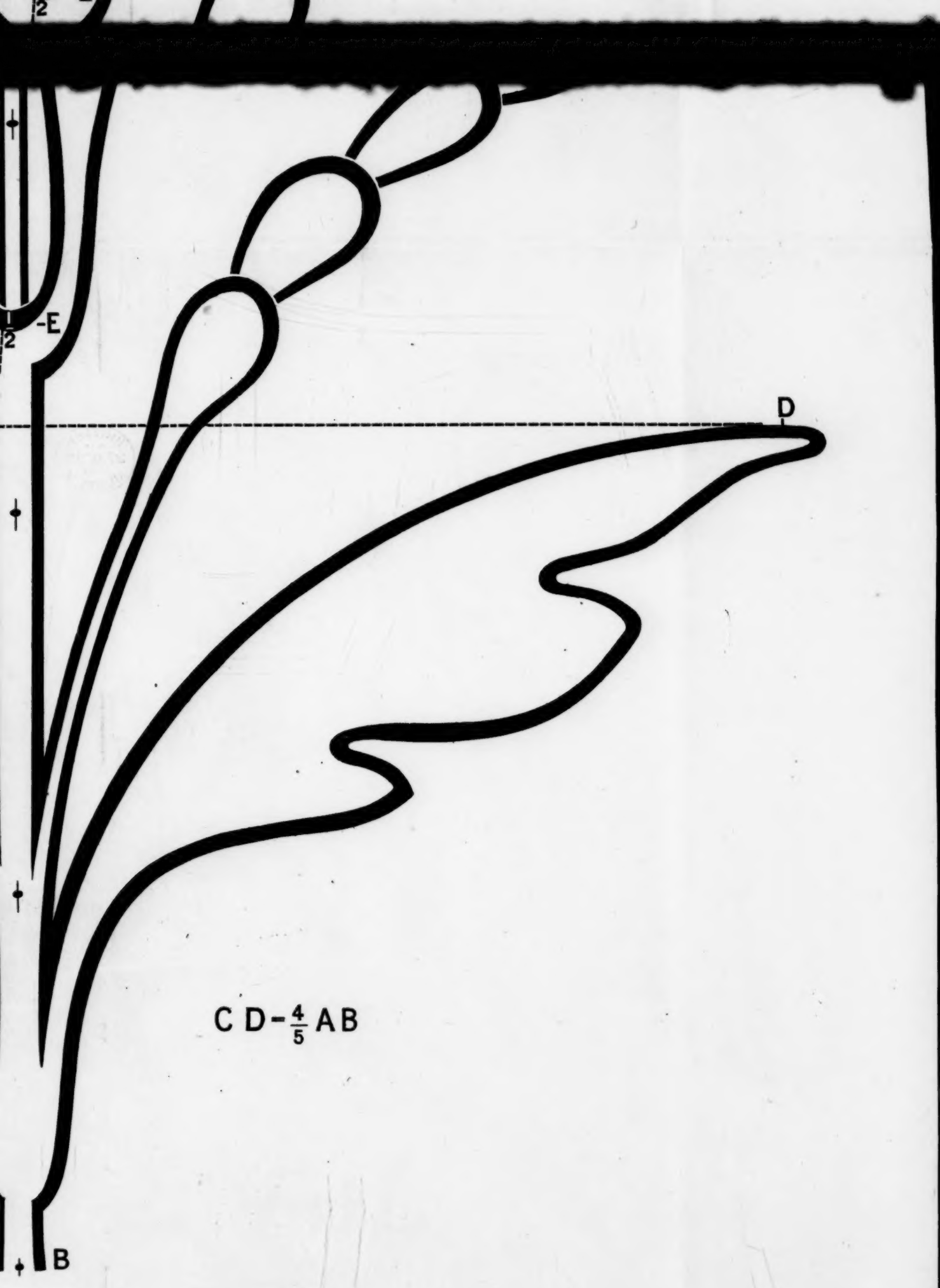
XAMINATION TEST.

REEHAND





LONDON:
JOSEPH HUGHES & CO., FROEBEL HOUSE, ST



ONDON :
OUSE, ST. ANDREW'S HILL, DOCTORS' COMMONS, E.C.

GREGORY'S GEOGRAPHICAL WORKS.

Crown 8vo., 420 pp. NEW AND ENLARGED EDITION (SEVENTH). Price 2s. 6d.

INCOMPARABLY THE BEST ELEMENTARY PHYSIOGRAPHY EVER PUBLISHED.

ELEMENTARY PHYSIOGRAPHY,

WITH NUMEROUS ORIGINAL ILLUSTRATIONS.

By R. A. GREGORY,

Oxford University Extension Lecturer; Honours Medallist in Physiography; Formerly Computor to Solar Physics Committee, The Royal College of Science, South Kensington; Fellow of the Royal Astronomical Society; Foreign Correspondent of the 'Revue Générale des Sciences.'

UNSOLICITED TESTIMONY OF EXPERTS.

J. BANNISTER, Esq., Stepney Pupil Teachers' School, Trafalgar Square, E., writes:—'We like the book very much and intend to use it at once. Please send thirty-two copies.'

J. W. SMITH, Esq., B.A. (Lond.), Central Higher Grade School, Hull, writes:—'I am delighted with the book, and have at once introduced it here.'

Miss E. J. CLAYDEN, P.T.'s Central Classes, Simms Cross, Widnes:—"Gregory's Physiography" is simply splendid, and I intend it to supersede the ordinary "Physical Geography" in use in my classes.'

A. HARVEY SMITH, Esq., Wesleyan Higher Grade School, Hanley, writes:—'I consider it is most admirable and thorough. It is certainly a more complete manual than any I have previously seen on the subject.'

D. RENTON, Esq., School-house, Macduff, writes:—I have now carefully examined the Physiography, and have no hesitation in saying that it is one of the best books on the subject that I know.'

ARTHUR WHEATLEY, Esq., B.A., B.Sc., Lecturer on Physiography, Technical College, Bradford, writes:—'The best I have seen. I shall recommend it.'

THOS. HUDSON, Esq., Rodley Board School, Leeds, writes:—'As a teacher of Physiography for many years I hail with pleasure the publication of such a work at so small a price.'

ALEX. ANSELL, Esq., Lecturer on Physiography, Sowerby Bridge:—'The best in the market undoubtedly, and I shall introduce it.'

F. TROUT, Esq., Ch. Ch. Boys' School, Newark, writes:—'Consider it an excellent book. It is a little singular that this very evening I received a note from a friend of mine who teaches Physiography at the University College, Nottingham, mentioning this same book, and recommending me to adopt it. I shall certainly adopt it.'

A LONDON SCIENCE WRITER AND LECTURER says:—'Gregory's book on Physiography is truly excellent, and meets all the wants of the student in a thoroughly workmanlike way.'

JOHN R. MALEY, Lecturer on Physiography, Poplar, E., writes:—'Shall certainly recommend it this season.'

JAS. WALLIS, Esq., St. Thomas Charterhouse Pupil Teacher Centre, Goswell Road, E.C., writes:—'Its great feature is the splendid way in which the Physical and Astronomical Geography is treated.'

JAS. WAUGH, Esq., B.A., Higher Grade School, Howard Gardens, Cardiff, writes:—'I am so pleased with it that I intend to introduce it into my school. It is just such a book as I have wished for a long time—one simple enough to be used almost as a Geographical Reader, and at the same time just condensed enough to make suitable answers to the science questions. I am particularly pleased with the Astronomical part. Your manner of dealing with this difficult section of the Syllabus, and the accompanying illustrations, are capital.'

T. BASTOW, Esq., B.A., B.Sc., Head Master of the Shipley Technical Schools:—'I am exceedingly pleased with Gregory's Physiography, and shall certainly bring it into use in my classes.'

GEO. TURNER, Esq., Science Lecturer, St. Paul's School, Middlesbro', writes:—'I beg to thank you very warmly for the excellent work on Physiography you sent me. I think very highly of it, and shall use it in our Physiography class this year.'

THOMAS SCALLAN, Esq., Temple Street Science School, Sligo, writes:—'Superior to any other text-book I have seen on the subject.'

Now Ready. Third Edition. Price 4s. Illustrated. Post Free, 3s.

ADVANCED PHYSIOGRAPHY.

By R. A. GREGORY, F.R.A.S., *and* **J. C. CHRISTIE, F.G.S.,**

Oxford University Extension Lecturer. *Lecturer in Geology at the Glasgow and West of Scotland Technical College.*

THE NEWCASTLE DAILY CHRONICLE says:—'We are glad to welcome a text-book of "Advanced Physiography" by Mr. Richard Gregory, which is supplementary to the elementary work of the author. This volume, like the other, covers its ground better than any other on the subject. There is nothing either of the scrappy or superfluous about it. The sections are well-jointed, and the style is very simple and direct. Mr. Christie adds three excellent chapters upon the condition of the earth's interior. The diagrams and illustrations are numerous and good, and the book is well indexed, and the work of an able teacher all over.'

NATURE, August 10th, 1893, says:—'We confidently recommend the book to the notice of teachers, for it is certainly one of the most excellent expositions of the subject we have yet seen.'

Mr. T. W. PIPER, St. Katherine's Training College, Tottenham, says:—'We shall at once adopt it at the College.'

Now Ready. Extra Cloth. Price 4s. 6d. nett.

HONOURS PHYSIOGRAPHY.

By R. A. GREGORY, F.R.A.S.,

AND

H. G. WELLS, B.Sc., LOND.,

Lecturer in Geology at the University Tutorial College; Third in Honours in Geology and Physical Geography at B.Sc.; Fellow of the Zoological Society; Fellow (in Honours) and Dorek Scholar of the College of Preceptors.

One of H.M.I. says:—'I find several questions for the Scholarship Examinations, 1891, taken verbatim from Gregory's book.

ADOPTED IN TRAINING COLLEGES AND P.T. CENTRE SCHOOLS.

SIXTH EDITION. Crown 8vo. Extra Cloth. Price 3s. 6d.

PHYSICAL AND ASTRONOMICAL GEOGRAPHY.

Specially designed for Pupil Teachers and Scholarship and Certificate Candidates. WITH ORIGINAL ILLUSTRATIONS.

OPINIONS.

ONE OF THE BEST-KNOWN EDUCATIONALISTS OF THE DAY writes:—'Mr. Gregory's Manual is simply magnificent.'

CHARLES W. REECE, Esq., Lecturer on Geography, Pupil Teachers' School, Thomas Street, London, E., writes:—'I have no hesitation in saying that the book is a splendid one. Mr. Gregory should be proud of it. I shall certainly recommend it. It ought to be not only in the hands of those for whom it is especially written, but also of every teacher of geography. The illustrations, type, and style of publication will be appreciated by all.'

THE UNIVERSITY CORRESPONDENT says:—'This Manual begins with some luminous explanations of various lineal, angular, and superficial measurements used in Physiography, and ends with a short classification of the races of mankind. The treatment is throughout full and lucid; the matter good and well chosen; the numerous original drawings are highly instructive (*e.g.*, those illustrating the causes of air-currents on pp. 154, 156); the printing is clear; the binding, and execution of the cuts, leave nothing to be desired; and at the end of most of the eighteen chapters into which the book is divided, there is a useful summary of the contents of the chapter.'

THE ROYAL COLLEGE OF SCIENCE MAGAZINE says:—'Astronomical and Physical phenomena are dealt with in such a comprehensive, simple, and accurate manner, as must at once recommend it to pupil teachers and scholarship students, for whom it is primarily intended. Teachers of Elementary, and even advanced Physiography, would do well to adopt it as a text-book; while our own students would find the Astronomical portions particularly helpful at the end of their first year. The style is lucid, and easy for Elementary students to understand; the numerous illustrations and diagrams are excellent. A recapitulation at the end of each chapter will be found very useful for examination work.'

NATURE says:—'The general conception and arrangements of this volume are very good, and the same may be said of the detailed treatment of most of the subjects discussed. The chapter on the rotation of the Earth and consequent phenomena is exceedingly good, as is the following one on its revolution. The account of eclipses and of the tides is exceedingly good, and well calculated to render these phenomena intelligible to learners. The chapters on the atmosphere and its movements are also clear and instructive, as are those on oceans and ocean currents. The numerous illustrations are clear, and elucidate some of the more difficult problems discussed.'

London: JOSEPH HUGHES & CO., Froebel House, St. Andrew's Hill, Doctors' Commons, E.C.

CIVIL SERVICE EXAMINATIONS.

TUITION BY CORRESPONDENCE; Unique System; Numerous Recent Successes; 700 Passes. Prospectus free. *See*

KEEFE'S NEW CIVIL SERVICE MONTHLY

(considerably enlarged), issued on the First of the Month, post free 2½d., contains the Latest Information, Examination Papers, and other interesting news relating to the Civil Service. May be had from

J. KEEFE, F.R.G.S., 120, BOLD ST., LIVERPOOL.

EPPS'S COCOAINE

COCOA-NIB EXTRACT.

(Tea-like.)

The choicest roasted nibs (broken-up beans) of the natural Cocoa on being subjected to powerful hydraulic pressure, give forth their excess of oil, leaving for use a finely-flavoured powder—'Cocoaine,' a product which, when prepared with boiling water, has the consistence of tea, of which it is now, with many, beneficially taking the place. Its active principle being a gentle nerve stimulant, supplies the needed energy without unduly exciting the system.

Sold in packets and tins, labelled:

JAMES EPPS & CO., Ltd., Homœopathic Chemists, London.

SCRIPTURE.

ADMISSION TO TRAINING COLLEGES.

Full Notes, Hints, Pamphlets, &c., **1/-** Tuition if desired.

ARCHBISHOPS' CERTIFICATE.

Guide, Notes, Pamphlets, &c., **1/-** Tuition, full fee, **10/-**

Address, F. ACHATES, 14, PERCY STREET, HULL.

Now Ready. New Edition. Extra Cloth. Price 2/6.

OUTLINES OF BRITISH HISTORY

FOR

PUPIL TEACHERS,

Scholarship & Matriculation Students,

WITH MAPS, PLANS, GENEALOGICAL TABLES, &c.

BY

B. BOYD-CARPENTER, M.A.,

University Extension Lecturer in History;

AND

G. E. GREEN, M.A.,

English Master at the Leys School, Cambridge; Late Scholar of St. John's College; Senior Historical Tripos (1885); and Senior Whewell International Law Scholar.

The Punjaub Patriot says:—'A more up-to-date and intelligent introduction to the History of England than any of the same size and scope published anywhere up to the present time. It is quite as much the history of English Kings, Queens, Generals, and Battles, as of England's progress in Arts, Literature, Trade, Commerce, Civilisation, and Polity. An important feature of the book is the attempt (and a successful one, too) of giving brief but interesting connected narratives under such heads as "Literature in the 19th century," "Ireland," "The Eastern Question," &c., &c. It is amply provided with maps, plans, and genealogical tables.'

Now Ready. Price 8d.

GREEN'S

DATE-BOOK OF BRITISH HISTORY.

Based on BOYD-CARPENTER and GREEN'S 'Outlines.'

An Invaluable Companion to any Text-Book on History.

JOSEPH HUGHES & CO., Froebel House, St. Andrew's Hill, Doctors' Commons, London, E.C.

Crown 8vo., 160 pp. Third Edition. Price 1s. 6d

ESSAYS, ESSAY-WRITING

AND

PARAPHRASING,

BEING

Models and Hints for Pupil-Teachers, Scholarship Candidates, and Students.

BY

C. J. DAWSON, B.A. (LOND.),

Head Master under the London School Board; formerly President of the National Union of Teachers.

The treatment of the subjects, and the matter of the essays will, it is hoped, have a definite interest for students, and prove practically useful in preparing for an exercise for which cramming processes are altogether unavailing.

Considerable pains have been taken to make the section on paraphrasing really serviceable, and to illustrate it by many examples of varied character.

The Teachers' Aid says:—'Mr. DAWSON has put into this book a labour of love and much literary taste and knowledge. The publisher presents the result in a dainty dress, far superior to the common run of Eighteenpenny manuals. The Model Essays are praiseworthy for feeling, matter, and style, and the thirty pages allotted to paraphrasing supply a want in a very creditable manner.'

The Schoolmaster says:—'The book takes a wide view of the subject, combining principles with practice in a particularly instructive manner. The results of large reading are laid before the student for his guidance in original composition, and Mr. DAWSON'S style is well worthy of careful observation and imitation till the learner has formed one of his own. . . . . The book can be strongly recommended to the student of English Composition.'

The University Correspondent says:—'Mr. DAWSON'S hints and advice are thoroughly sound, and the specimen essays he gives show that he practises what he preaches.'

JNO. B. GAUNT, Esq., B.A. (Lond.), Head Master of the Pupil-Teachers' School, Newcastle-on-Tyne, writes:—'A very admirable and useful work, and if the others of the series are of equal merit they will certainly secure a wide-spread use.'

H. A. JOHNSTONE, Esq., Head Master, Brentnall Street Schools, Stockport, says:—'Such a book as this was badly wanted, and I am not surprised to hear that it is an assured success.'

The Civil Service Gazette says:—'We have looked this educational work carefully over, and are therefore in a position to state that it is all that it professes to be. It is intended to be of service to Pupil Teachers, Students, and Candidates for Civil Service and other Examinations, and it will be found to admirably answer that intention. . . . . Must be of permanent value to all who use it as their text-book.'

The Methodist Recorder says:—'The book may be strongly recommended to those for whom it is designed.'

The Graphic says:—'A more practical and useful work is . . . Mr. DAWSON evidently knows what he is writing about.'

The Manchester Guardian says:—'He has produced a guide to the literary toilet.'

The School Board Chronicle says:—'Contains a number of model essays, written in excellent English, and prefixed in every case by valuable hints.'

JOSEPH HUGHES & CO., Froebel House,
St. Andrew's Hill, Doctors' Commons, London. E.C.

NOW READY. SIXTH EDITION. PRICE 1s. 6d.

SCHOLARSHIP SCHOOL-MANAGEMENT.

BY

A. T. FLUX,

First on the Scholarship List; Head-Master Pupil Teachers' Centre School, Belvedere.

The Lady who Topped the Last Scholarship List used Flux's School-Management.

THE BOARD SCHOOL TEACHER says:—'Full of judicious hints and ideas.'

THE INFANTS' MISTRESS says:—'Our opinion of the work is that no better guide for the scholarship candidate in this subject has ever appeared. We have adopted the book for our own students, and we recommend all teachers who have to train pupil teachers for the Scholarship Examination to see that their students do not lose the great help which can be got from this excellent little text-book.'

THE SCHOOL BOARD CHRONICLE says:—'The book covers all this ground in a practical and excellent manner. Then there is the official School-Management paper for one year, followed by fifteen years' Scholarship School-Management questions, classified according to subjects.'

THE SCHOOLMASTER says:—'The work is sound, systematic, and conveniently arranged, and the model answers at the end, together with the classified questions, will prove a boon to students.'

JOSEPH HUGHES & Co., Froebel House, St. Andrew's Hill, Doctors' Commons, London, E.C.

Now Ready. Extra Cloth. Price 2/-

ARITHMETIC PRIZE PAPERS.

BY

W. P. WORKMAN, M.A., B.Sc.,

Head Master, Kingswood School, Bath; late Fellow of Trinity College, Cambridge.

EXTRACT FROM PREFACE.

'For many years past a silver medal has been awarded annually at Kingswood School "to the best Arithmetician." The endowment for this purpose was left to the school at a time when Arithmetic was almost the only mathematical equipment of an educated gentleman. I have little doubt that the donor meant "the best Mathematician," but, unfortunately, he did not say so; and, if we are not to award to the mere vulgar tot-totaller a prize to which decades of traditions attach, there remains, short of an application to the Charity Commissioners, no method by which the founder's wishes can be carried into effect save by setting a paper which shall be about as hard as it is possible to make Arithmetic, shall evoke reasoning power more than mechanism, and shall test knowledge of principles rather than knowledge of rules. A few comparatively simple questions are inserted in order that the shorn lambs of lower Forms may feel some kindly airs among the blasts, but the main body of questions are intended for the Mathematical Arithmetician. About half the questions are original, and in other cases their sources are stated, as far as known, except when taken from standard text-books.

'The papers, full solutions of which are appended, will serve to draw attention to several points in the theory of Arithmetic which have been rather slighted in English text-books, particularly in regard to circulating decimals, which afford one of the most attractive fields possible for him whom I have called the Mathematical Arithmetician. The restrictions at the head of the first paper sufficiently indicate my own conception of the border-line to be drawn between Arithmetic and Algebra. Algebra I hold to be the science of continuously varying numbers, Arithmetic of discontinuous numbers. Equations and symbols for unknown quantities logically involve the idea of continuous variation, and are therefore inadmissible. The Progressions are arithmetical; Scales of Notation of course are; so also much of the Theory of Numbers and most of the Theory of Interest and Annuities. But scanty use, however, will be made of rules outside the ken of the ordinary Arithmetician.

'It may be of interest to schoolmasters if I add that the prize-winner generally gets about half to one-third of maximum marks, and that the time allowed for the paper is three hours.'

JOSEPH HUGHES & CO., Froebel House, St. Andrew's Hill, Doctors' Commons, London, E.C.

A SUCCESS UNPARALLELED IN EDUCATIONAL JOURNALISM.

PRICE **One Penny** EVERY WEEK.

THE

INFANTS' MISTRESS.

KINDERGARTEN AND NEEDLEWORK TEACHER.

CHIEF CONTENTS.

Excellent Infant Schools and their Mistresses.
A series of Illustrated Sketches of Excellent Infant Schools, with Portrait of Head Mistress, and copy of Time Table in use.

Chats with an Inspector on our Infants' Schools: What they are, and what they ought to be.

New Games for the Babies.

Varied Occupations. Illustrated.

New Mental Arithmetic Questions for Infants and Standard I.

A Pestalozzi Pilgrimage. Illustrated.
By Miss DODD, Owen's College, Manchester.

New Plays for Infants. **Our World.**

Kernel Sayings.

Froebel House Correspondence Classes.
A special course of Preparation for the Froebel Union Elementary Certificate.

Special Reports of the London School Board Meetings.

Animal Lessons.

Recent Examinations of Infants' Schools.

New Recitations for Infants.

Serial Stories by Well-known Writers.

Tea-Table Talk. **Our Lawyer.** **Our Answers.**

Needlework Queries answered by Miss SOPHY LOCH, Examiner to the London School Board.

Book Gossip. **To-Day and Next Week's Engagements.**

Scotch Notes.
Chats with an Inspector, &c.

Big Type Sums, with Answers.

Prize Competitions.

Annual Subscription (Including all Supplements), post-free, **6/6.**

JOSEPH HUGHES & CO., FROEBEL HOUSE, ST. ANDREW'S HILL, DOCTORS' COMMONS, LONDON, E.C.

☞ Adopted in Training Colleges and at P.T. Centre Schools. For Pupil Teachers, Scholarship, Certificate, and Matriculation Stude

NOW READY. Fourth Edition. Crown 8vo. 380 pages. Price 3/6.

DESCRIPTIVE GEOGRAPHY

A TEXT-BOOK PROFUSELY ILLUSTRATED WITH

ORIGINAL MAPS, DIAGRAMS, &c., &c.

WITH AN APPENDIX OF EXAMINATION QUESTIONS.

By SAMUEL BROOK,

Head Master of the Senior Practising Schools, Westminster Training College.

The Young Lady who topped the last Scholarship Examination Used BROOK'S DESCRIPTIVE GEOGRAPHY.

UNSOLICITED TESTIMONIALS.

From an INSPECTOR'S ASSISTANT:—'It is a thoroughly practical work by a practical man; matter, style, print, and maps are everything that can b desired, and the diagrams cannot fail to be very helpful to the student.'

From H. E. HULL, Esq., Head Teacher, Hackney P.T. Centre, London School Board:—'I have examined it, and consider it excellent. Mr. Brook a his Publisher may be proud of such an admirable book.'

From H. HANFORD, Esq., Little London Board School, Willenhall:—'I shall recommend it to the students of my Scholarship and Certificate Classes.'

From the Principal Midland Scholarship and Certificate Centre:—'We consider it a decided step forward in the treatment of its subject, and it should ha a large sale. We shall place it on our list.'

From G. H. SPARROW, Esq., Scholarship and Correspondence Classes:—'I shall not fail to recommend it.'

From E. PRIESTLEY, Esq., Head Master, Kendrick Middle School, Reading:—'It certainly is the best in the market, and should have an enormous sale.'

From J. W. RYMER, Esq., B.A., Head Master, Wesleyan School, Barnsley:—'Mr. Brook's "Descriptive Geography" is sure to be a favourite wherever know It is exceedingly interesting in style and matter, as well as attractive in appearance; it renders the study of Geography alike easy and pleasant, and its informa is up to date.'

From ED. A. MILLS, Esq., Scholarship and Certificate Coach, Croydon:—'It certainly deserves the name of "Descriptive." I do not know any gra Geography that so fully describes towns and coasts as this does. The geography of Africa is particularly good.'

JOSEPH HUGHES & CO., FROEBEL HOUSE, ST. ANDREW'S HILL, DOCTORS' COMMONS, LONDON, E.C.

NOW READY. FOURTH EDITION. Price 3/6.

☞ A New Grammar for Pupil Teachers, Scholarship, Certificate, and Matriculation Candidates.

THE ELEMENTS OF ENGLISH

BY

GEORGE BEACH, M.A., LL.D.,

Author of 'A Series of Entertaining Readers.'

Adopted in English and Scotch Training Colleges, London and Provincial (Board and Voluntary) P.T. Centre Schools, and the various Training Classes throughout Great Britain.

OPINIONS.

J. W. WREN, Esq., Head Master, Pupil Teachers' School, Deptford (London School Board):—'I think Dr. BEACH'S English an admirable book. It meets the wants of P.T.'s better than any work I know. I shall certainly recommend it for use here.'

The SENIOR LECTURER (English Training College):—'Admirably suited for its purpose.'

ARCH. FLEMING, Esq., M.A., Head Master, Lossiemouth Public School, Elgin:—'I have examined Dr. BEACH'S "English" with care, and introduce it at once to P.T.'s and advanced ex-standard scholars as far and away the best text-book I can put into their hands. Send on 10 copies.'

The Teachers' Aid says:—'The arrangement and type are especially clear, the lists of answered questions are particularly useful. Taken altogether, the book is thoroughly efficient.'

The Schoolmaster says:—'Dr. BEACH has produced a useful text-book for pupil teachers and other young students of English. The definitions and explanations are simple without being unscientific; *every part of the subject is well illustrated by examples* and enforced by specimen questions from various examination papers. The history of the language is well treated in a necessarily concise, but comprehensive manner.'

The Practical Teacher says:—'This book has been written with a purpose, viz., that of providing a text-book from which may be answered the peculiar questions set by examining bodies, complicated as they often are, in the case of teachers, by questions of Pedagogism. We have examined it carefully, and can vouch for the accuracy of the statement in the preface, that it leaves no part neglected in respecting which the Education Department has propounded any query during the past twenty years. Students therefore, of whatever grade, whether pupil teacher Scholarship or Certificate candidate, may buy the book, feeling perfectly sure that in it their wants will be met. Questions of difficulty are discussed as they aris and conclusions drawn which, though they may not convince everybody, show th the author knows what he is talking about.'

'The arrangement of the book, the type, and the binding, are among the bes of their class. A very good feature is that which gives the derivation of the tec nical terms in connection with the chapters where they are first used. Anothe good feature is that which places the questions on the chapters immediately afte the chapters. Among these are many *answered* questions—*models of what answers should be.*'

'The work is evidently written by one who knows what he wants to say, an says it in a crisp, clear, and correct fashion. It will be a welcome addition to th libraries of those who are fond of books on English, and it will be found in ever way suitable and sufficient for pupil teachers, college students, and candidates fo Certificates, who often have to confine themselves to one book.'

JOHN CAMERON, Esq., Rector, Technical College, Montrose, N.B.:—'I have examined "Elements of English" and introduced it to my senior class. I consid it admirable in matter and arrangement.'

JOSEPH HUGHES & CO., FROEBEL HOUSE, ST. ANDREW'S HILL, DOCTORS' COMMONS, LONDON, E.C.

☞ ADOPTED BY SCOTCH AND ENGLISH TRAINING COLLEGES.

READY. (Fifth Edition.) Price 4s. 6d.

HUGHES'S DOMESTIC ECONOMY.

Specially designed for Pupil Teachers, Students in Training, Certificate Candidates, and School-mistresses.

SEC. I.—**HUMAN PHYSIOLOGY** (Elements of).
By WALKER OVEREND, M.B. (Oxon.), B.Sc. (Lond.), Late Scholar of Balliol College, and Radcliffe Travelling Fellow;
Deputy Lecturer on Physiology at St. George's Hospital, London, W.

*** This Section is profusely illustrated by diagrams drawn and engraved from original sketches by the Author.

SEC. II.—**DOMESTIC HYGIENE** (as per Stage I. Sc. & Art Dept.).
By ELIZABETH J. MOFFITT, B.Sc. (Lond.).

SEC. III.—**PREPARATION OF FOOD FOR THE SICK.**
By ALFRED CARPENTER, M.D., D.P.H.,
Late Examiner to the London and Cambridge Universities.

SEC. IV.—**PLAIN COOKERY.**
By Mrs. B. W. GOTHARD,
Gold Medallist in Cookery, &c.

SEC. V.—**CLOTHING AND LAUNDRY WORK.**
By Miss MANN,
Lecturer at the Domestic Economy Training School, Liverpool.

SEC. VI.—**HOUSEHOLD MANAGEMENT, EXPENSES, AND INVESTMENTS.**
By Mrs. BURGWIN,
Member of the Executive, National Union of Teachers.

SEC. VII.—**HOW TO MAKE THE HOME PRETTY.**
By MAY MORRIS.

☞ **The Section dealing with Elementary Human Physiology has been included owing to the recommendation of the Royal Commission on Education.**

The first two Sections of the Book, therefore, exactly meet, in all respects, the requirements of the First or Elementary Stage in Hygiene.

UNSOLICITED TESTIMONIALS.

From the Lecturer on Domestic Economy at one of the largest London Training Classes.—'I consider the work excellent in every respect, and any student using it will have nothing to fear at the Examination. The section of Physiology is especially valuable, as the science of food cannot be understood without it, and I know of no book which treats this properly. The subject matter is full, concise, and correct. What before could only be obtained by reading parts of many large works on the various subjects, is here presented complete in the clearest possible manner. **It is the only book which covers adequately the Syllabus for the Certificate Examination, and is undoubtedly the best work on this wide subject.**'

From the Science Demonstrator to a large School Board.—'I consider such a book should be in every school where Domestic Economy is taken as a specific subject. If such a book were available for reference by teachers, and was well used, the number and quality of the passes in this subject would be largely improved.'

From a Head Inspector of Schools.—'A most exhaustive treatise on a very important subject.'

From the Head Master of one of the largest Pupil Teachers' Centre Schools (London School Board).—'This is just the book for the use of the P.T.'s. I have been carefully through it, and say, without hesitation, that **it is the best book I know on the subject for the use of P.T.'s.**'

PRESS OPINIONS.

The Practical Teacher says:—'Never before, so far as we are aware, has the important subject of Domestic Economy been so thoroughly and effectively treated in a single volume as in the compact and substantial manual before us. The editor, recognising the composite and comprehensive nature of the subject, has adopted the somewhat novel plan of entrusting the different branches to different hands; and he has succeeded in securing for each of the seven sections of the book a writer eminently qualified for the task undertaken. This manual, we feel sure, will not only be found to meet every requirement connected with its primary purpose of preparing pupil teachers and students for passing the examination in Domestic Economy, but it will prove useful to those teachers who have to teach the subject, and to the many housewives who have to put its teachings into practice.'

The School Guardian says:—'A new manual of Domestic Economy, the joint work of no fewer than seven different writers, has been recently issued by Mr. Joseph Hughes. It is primarily designed for the use of pupil teachers, students in training colleges, and school-mistresses, but it covers a wider ground than that required of female candidates at the certificate examination, and, moreover, contains so much sensible and useful information of general interest, particularly to housewives, that we hope it may meet with a wide sale.'

The Educational News says:—'It is impossible to peruse such a book without forming higher ideas of every-day life, and without acquiring a better knowledge of how to realise them, than would otherwise be practicable.'

The Scottish Leader says:—'May Morris adds a lively sketch, which all ladies should read, on "How to Make the Home Pretty." The volume is both neat and cheap, and should find a place in every family library.'

The Manchester Guardian says:—'Housekeepers of any degree of wealth might derive benefit from the hints upon domestic matters scattered up and down the book.'

The Leeds Mercury says:—'An admirable manual either for the school-room or the household. Many helpful illustrations and diagrams add to the value of the book.'

The Manchester Examiner and Times says:—'This book will be very helpful to school-mistresses and pupil teachers, for whom, indeed, it is specially designed, but it will also be exceedingly serviceable to the young wife who may require reliable information and sound advice on the interesting subjects with which it deals. **The book is the best treatise on Domestic Economy that we have met with.**'

JOSEPH HUGHES & CO., FROEBEL HOUSE, ST. ANDREW'S HILL, DOCTORS' COMMONS, LONDON, E.C.

For 1895 Code.

A HEAD MASTER writes:—'They seem to me to be just the thing to g confidence at the coming Examinations.'

WILSON'S

THREE R.'s TEST CARD

For Standards II. to VII. Price **1s.** *per packet.*

One Packet—any Standard—sent post free for **10d.** in stamps.
A Specimen Set (all Standards) sent post free for **4/-**

ADVANTAGES.

1. These Cards contain,—*On one side:* Arithmetical Tests for BOYS.
   „ „ GIRLS.
   On the other side: 'UNSEEN' Tests in READING.
   „ „ DICTATION.
2. There are 36 Cards in each Packet, with Answers, and a **Book containing all the 'Unseen' Reading Dictation Exercises.**
3. The Arithmetical Examples are fully **up to date,** and embrace many of the Exercises most recently g **75 per cent. are H.M.I. actual Tests,** and the remaining 25 per cent. are variations of these.
4. The Answers are **correct,** and may therefore be relied upon.
5. The 'Unseen' Exercises in Reading and Dictation have been most carefully selected, many of them b actual Extracts given by H.M.I.
6. The Teacher will have all the Exercises together in a small **Book,** given away with each packet.

The ordinary difficulty in Examining children in 'Unseen' Reading will therefore be overcome.

'Over-haste in education is much to be deplored. Forced growth is seldom healthy; but in the hurry worry of getting up classes for inspection the ingenuity of teachers is cultivated. The inventive faculty been stirred about how facility of manipulation of tests may be managed, and the test card of the Inspe has been matched by that of the instructor. If these are used to follow up and test wisely-given and w graded teaching, they are most useful; but if employed only in stimulating the art of passing, they grievously misused. The cards before us, of which Standards II.-VII. have come to hand, are judiciously va and ingeniously arranged. Arithmetic on one side, and Reading or Dictation on the other. They may that used in class teaching or in individual testing, and in a great many permutations may be made effectin securing revision. They could be advantageously made use of for silent work under the eye of a pupil teac while the master or mistress was engaged in oral instruction. The skill displayed in their arrangem commendable, and their matter is excellent. Small keys are furnished with each series.'

Educational New

Price 1s. per Packet. The Cheapest Cards ever Published.

SPECIMEN SET SENT POST FREE TO ANY TEACHER FOR **4s.**

JOSEPH HUGHES & CO., Froebel House, Doctors' Commons, London, E.

FRANÇOIS COPPÉE'S LE TRÉSOR.

☛ SCHOLARSHIP and CERTIFICATE Students will find Literal and Free Translations of 'Le Trésor' week by week in the columns of

THE

GIRLS' Mistress.

Price ONE PENNY. Annual Subscription, 6/6.

Chief Contents of Weekly Issues:

CLASS SUBJECTS UNDER THE NEW CODE. By an Inspector of Schools.

MODEL GIRLS' SCHOOLS, AND HOW THEY ARE MANAGED: A Series of Illustrated Interviews. With Portrait and Autograph of Mistress, and copy of Time Table in use.

SUITABLE OCCUPATIONS. Illustrated. By J. Vaughan. Edited by George Ricks, B.Sc., Inspector of Schools, School Board for London.

CHATS WITH CHILDREN ON DOMESTIC ECONOMY. By Ethel R. Lush, Head Mistress of the Ipswich Higher Grade Girls' School; Organising Mistress to the Ipswich School Board; and late Lecturer on Hygiene and Domestic Economy at the Derby Pupil Teachers' Centre.

OUR NEW PUPIL TEACHERS' COURSE. By A. T. Flux; First on Scholarship List; Head Master Pupil Teachers' Centre, Belvedere; Author of 'Scholarship School Management.'

COOKERY COURSE. By Miss Tattersall, Organiser and Superintendent of Cookery to the London School Board.

OUR DRAWING MASTER. By F. E. Smith, Visiting Art Master to the Norwich School Board. Freehand Drawing, with many Illustrations. Questions answered Free.

STANDARD PROBLEMS FOR GIRLS, AND HOW TO SOLVE THEM. By T. B. Ellery, President of the National Union of Teachers.

FULL NOTES OF LESSONS. By Wm. Done, B.A., Head Master P.T.s' School, Brighton.

THE L.L.A. OF St. ANDREWS: What It Is, and How to Get It. A Special Course of Preparation by Thos. Cartwright, B.A., B.Sc., Lond.

TRANSLATION OF 'LE TRÉSOR' for Scholarship and Certificate Students.

OUR TRAINING COLLEGES.

RECENT EXAMINATIONS OF GIRLS SCHOOLS.

OUR COUNSEL'S OPINION ON SCHOOL LAW, CODE, AND OTHER MATTERS.

BIBLE LESSONS. By an Inspector of Schools. OUR 'AT HOME.'

ALL THE NEWS OF THE WEEK UP TO DATE.

SCOTCH NOTES. REVIEWS. NEW DICTATION TESTS.

NEW COMPOSITION STORIES.

OUR NEEDLEWORK EDITOR. By Miss Loch, Examiner to the London School Board, who answers all Questions, Examines Scholars' or P.T.s' Work, and sends Samples free to Subscribers.

HOW TO MANAGE VILLAGE MIXED SCHOOLS. By an Inspector.

☛ *ORDER YOUR BOOKSELLER TO SUPPLY THE PAPER REGULARLY.*

JOSEPH HUGHES & CO., Froebel House, St. Andrew's Hill, Doctors' Commons, London, E.C.

LONDON MATRICULATION EXAMINATIO

JUNE 1895.

146 **146**

University Correspondence College Student

WERE SUCCESSFUL AT THIS EXAMINATION.

CLASSES FOR MATRICULATION, JANUARY 1896.

For those who have failed at the recent examination, a Short Course for January 1896, is provided, in which work begun at any time by arrangement. **Fee for all Subjects, £3 13s. 6d. Single subjects cannot be taken. Classes in the** Course (January and June 1896) commence July 27th and August 31st.

SPECIAL OFFER.—A FREE COPY OF THE MATRICULATION DIRECTORY (containing full Solutions to the Papers, June 1895, and Advice on Text-Books, including Special Subjects, 1896) will be sent free to all Private Students who intention of presenting themselves for examination in January or June 1896. Application must be made to the Secretary, House, Cambridge.

INTER. ARTS AND SCIENCE AND PRELIM. SCI., 1896

Classes in the Ordinary Course commence August 3rd. **All fees are strictly inclusive and payable as arranged**

Students may join a Class which has already started by making arrangements for having back Lessons.

Prospectus and full particulars of Classes, Guide to Matriculation, or any Arts or Science Examination, post free on application

THE SECRETARY, Univ. Corr. Coll. London Office, 32, Red Lion Square, London, W.C.

The University Tutorial Series.

SPECIAL SUBJECTS FOR MATRICULATION, 1896.

FOR JANUARY 1896.

Ovid.—Heroides I., II., III., V., VII., XII. Edited by A. H. ALLCROFT, M.A. Oxon., and B. J. HAYES, M.A. Lond. and Camb., Gold Medallist in Classics.

PART I.—INTRODUCTION, TEXT, and NOTES. **2s. 6d.**

PART II.—A VOCABULARY (in order of the Text), with TEST PAPERS. *Interleaved.* **1s. 6d.**

PART III.—A CLOSE TRANSLATION. **1s. 6d.**

THE THREE PARTS IN ONE VOL. **4s. 6d.**

'The work communicates the maximum of knowledge in a minimum of words, is thoroughly scholarly, and adapted either for private or school study. . . . It seems to contain everything necessary for a mastery of the sense of these epistles.'—*Educational Review.*

'Like all the other books issued by the University Correspondence Press, this book is a marvel of excellence.'—*Board Teacher.*

'Nothing has been left undone that could possibly make the study of the text interesting and instructive.'—*Teachers' Aid.*

Xenophon.—Anabasis VII. A CLOSE TRANSLATION. By W. H. BALGARNIE, M.A. Lond. **1s. 6d.**

FOR JUNE 1896.

Cicero.—De Amicitia. Edited by A. H. ALLCROFT, Oxon., and W. F. MASOM, M.A. Lond.

PART I.—INTRODUCTION, TEXT, and NOTES. **1s. 6d.**

PART II.—A VOCABULARY (in order of the Text), with PAPERS. *Interleaved.* **1s.**

PART III.—A CLOSE TRANSLATION. **1s.**

THE THREE PARTS IN ONE VOL. **3s.**

'The argument of the several sections is cleverly and concisely epitomised, annotations refer precisely to the points requiring elucidation in grammar, or of allusions to historical incidents or philosophic opinions.'—*Educational*

Cicero.—In Catilinam III. Edited by A. WAUGH, M.A. Lond., Gold Medallist in Classics.
(Uniform with the above in price and arrangement of

Euripides.—Andromache. Edited by H. CLARKE, INTRODUCTION, TEXT, AND NOTES, **3s. 6d.** A CLOSE TION, **1s. 6d.** THE TWO PARTS IN ONE VOL., **1s. 6d.**

COMPLETE CATALOGUE *of over 350 Books, specially adapted for London University Exams., including Special Subjects for 1896,* **FREE ON APPLICA**

London: W. B. CLIVE, Univ. Corr. Coll. Press. Warehouse: 13, Booksellers Strand, W.C.

COUPON
PRACTICAL TEACHER
AUGUST 1895.

PRINTED BY EYRE & SPOTTISWOODE, *Her Majesty's Printers*, DOWNS PARK ROAD, N.E.
PUBLISHED BY THE PROPRIETORS, JOSEPH HUGHES & CO., AT FROEBEL HOUSE, ST. ANDREW
DOCTORS' COMMONS, LONDON, E.C.